

SECTION M, PART 0

OUTGOING CLASS OF TRUNK TEST

Index

		<u>PAGE</u>
M	TRUNK TESTING	MO-2
MO	OUTGOING CLASS OF TRUNK TEST, GENERAL	MO-3
MO-1	TEST FRAME SET UP WITH CLASS-OF-TEST TABLE	MO-4
MO-2	SEQUENCE CHART, OUTGOING CLASS OF TRUNK TEST	MO-4
MO-3	OUTGOING TRUNK TEST DESCRIPTION	MO-5
MO-3.1	OGT TEST PREPARATION	MO-5
MO-3.2	START OF OGT CLASS OF TRUNK TEST	MO-5
MO-3.3	SELECTION OF A MARKER	MO-6
MO-3.4	OPERATE CONNECTING AND TEST RELAYS	MO-6
MO-3.5	INPUT INFORMATION TO MARKER	MO-6
MO-3.6	SELECTION OF A PARTICULAR TRUNK	MO-7
MO-3.6.1	NTFS Key Operated	MO-7
MO-3.6.2	NTTS Key Operated	MO-8
MO-3.7	MARKER RELEASE	MO-9
MO-4	DESCRIPTION OF TRUNK TEST CIRCUIT OPERATION - OGT CLASS OF TRUNK TEST	MO-9
MO-4.1	Test of Automatic Disconnect Features with Trunk Test Circuit	MO-10
MO-5	TEST FRAME RELEASE	MO-10

M TRUNK TESTING

Several classes of trunk tests can be performed from the master test frame to test essentially all types of trunks in the No. 5 Crossbar office and incoming trunks is the distant connecting office. In general the master test control directs the marker to set up a connection to the trunk to be tested and the trunk circuit performs the test. This section of the SFD covers one of the classes of trunk test, in each part.

The OGT class of trunk test is used for testing outgoing trunks which require senders. A connection is set from the originating test line to the trunk under test. The TT relay of the trunk circuit is operated to transfer the outgoing tip and ring leads back to the trunk test circuit via the trunk test multiple. The trunk test circuit thus has control of both ends of the connection.

The IAO class of trunk test is used for testing intraoffice trunks. A connection is set from the originating test line to the terminating test line. The trunk test circuit thus has control of both ends of the connection.

The MISC class of trunk test is designed for testing miscellaneous type of trunks that are not furnished with TT relays but are selected by marker mate relays. The MISC class is also used to test regular types of outgoing trunk circuits when it is not desired to operate the TT relay. A connection is set from the originating test line and the termination depends on the type of trunk and the directory digits set on the A- to K- keys.

The ITDO class of trunk is used for testing certain features of incoming trunks in distant offices. A connection is established from the originating test line to an outgoing trunk. The call is directed to a test line in the distant office. The TT relay of the outgoing trunk is operated, but the tip and trip leads are extended back through the trunk test multiple to the trunk facility. The CS lead from the trunk through the trunk TT relay and the trunk test multiple allows supervision from the distant end to be monitored.

The ITNP class of trunk test is used for testing incoming trunks. A patch cord connection is made from the trunk test circuit to the trunk under test. The marker is then directed to set a connection from the incoming trunk to the terminating test line. The trunk test circuit thus has control of both ends of the connection.

The IMG trunk test (IAO class of test) is used for testing intermarker group subscriber to subscriber trunks. A connection is established from the originating test line in the calling marker group to the terminating test line in the called marker group. The trunk test circuit thus has control of both ends of the connection.

The OGT TANDEM class of trunk test is used for testing outgoing trunks arranged for tandem operation that require senders. A connection is established from the originating test line to the trunk under test. The TT relay is operated in the trunk circuit to transfer the outgoing tip and ring leads back to the trunk test circuit. The trunk test circuit thus has control of both ends of the connection.

The INC TANDEM trunk test (ITNP class of test) is used for testing incoming tandem trunks. A patch cord connection is made from the trunk test circuit to the incoming tandem trunk under test. The marker is then directed to set up a connection to an outgoing trunk having a TT relay and requiring a sender. The marker operates the TT relay and gives the sender a ND signal. The trunk test circuit thus has control of both ends of the connection.

MO OGT CLASS OF TRUNK TEST - GENERAL

The OGT class of trunk test is used for testing outgoing trunks which require senders. The Master Test Control (MTC) circuit connects to the Trunk Test (TT) circuit and signals it to prepare for a test of an outgoing trunk. The test circuit simulates an originating class of call and proceeds to connect to a marker which it directs to set up a connection from the originating test line, to the outgoing trunk to be tested. The marker is signaled to operate the TTM relay in the trunk link and the TT relay in the trunk which gives the trunk test circuit access to the outgoing end of the trunk. The marker extends a No Digits (ND) signal to the outgoing sender to allow it to release without pulsing. After the TT relay in the outgoing trunk circuit has operated, the TT relay connects the outgoing tip and ring, TO and RO leads, of the trunk circuit into the TLF trunk test multiple which is extended to the trunk test circuit. The outgoing end of trunk under test is now connected to the trunk test circuit which simulates an incoming trunk. In addition the trunk test circuit has access to the originating end of the connection at the originating test line. Thus, both ends of the trunk are under control of the trunk test circuit and the trunk features can be tested.

MO-1 TEST FRAME SET UP WITH CLASS-OF-TEST CHART

The class-of-test table summarizes in tabular form the key(s) and switch(es) used to establish an OGT class of trunk test on the chart. A single line across all columns is used to separate a particular function with its associated figure, option, key, or switch. The double line within the single lines is used to separate the various options on vintages of master test control frames. The note column and sheet notes are as follows:

- (a) Note 1 indicates that all key(s) or switch(es) must be operated to make a proper test frame set up for this particular class of test.
- (b) Note 2 indicates the key(s) or switch(es) to be used to simulate the trouble record. Refer to simulation tables in SFD-C802, C804, or C806 and their associated colored trouble record card on the opposite pages (C803, C805, or C807) or the simulated table selected. The tables and colored trouble record cards, along with the class of test tables, will assist the maintenance personnel in selecting the proper key(s) or switch(es) to be operated in order to properly simulate the reported trouble condition.
- (c) Note 3 indicates those key(s) or switch(es) used for additional marker tests, but they are not required for the trouble record test or a simulation test.

MO-2 SEQUENCE CHART - OGT CLASS (M004)

The sequence chart for the outgoing class of trunk test is a combination of a sequence chart and a flowchart. It is designed to show the main functional interactions between the Master Test Control (MTC) circuit, the Trunk Test (TT) circuit, the Master Test Frame Connector (MTFC) circuit and the Completing Marker (CM). Each double line box represents a particular circuit. The section and part of the SFD which provides full detail for the function is indicated within the box.

The overall progress of an outgoing trunk test call is depicted by the flow from one functional box to the next. Within each box are skeletonized sequence chart depiction of the major progress points and information flow. In addition the keys and switches which are set up for the class of call are shown. The primary use of this chart is to show this overall progress of the call with key points of detail. It can be used to isolate a general trouble area if the test call fails in the set up stages.

MO-3 OUTGOING TRUNK TEST DESCRIPTION

On an OGT class of trunk test the MTC directs a marker to set a connection from the originating test line to the trunk circuit under test. The trunk TT relay is operated transferring the outgoing tip and ring leads back to the trunk test circuit via the trunk test multiple of the trunk link frames. When the connection is established the trunk test circuit has control of both ends of the trunk circuit and can test various feature.

MO-3.1 OGT TEST PREPARATION

On an OGT class of trunk test the MTC simulates an Originating Register (OR) and primes the marker with the code, digits, local translation, class of service, and selected trunk information. This information, except for the particular trunk information is normally received from the OR. Keys and switches must be set to provide this information as detailed on the test setup chart on SFD-M002. In addition a telephone set should be plugged into the jacks of the master test frame telephone circuit and the TLK key should be operated.

MO-3.2 START OF OGT CLASS OF TRUNK TEST

Operating the ST key operates the ST relay (MTC) which closes ground through the operated TSTB (OGT) switch to operate the corresponding OGT relay. The operated OGT relay furnishes ground for the operation of the OTL1 relay which gives the marker the originating test line location. It also furnishes ground on the OTT lead, to signal the marker to operate the TT relay in the outgoing trunk, and on the NDI lead, to signal the marker to give the sender an No Digits (ND) signal.

Releasing the ST key removes the shunting ground from the winding of the TRK relay (SFD-J104) allowing it to operate in series with the previously operated OGT relay to ground furnished by KR relay. The TKT relay operates the TKT1 which operates the TKT2 relay. Operation of the TKT relay opens the lead from the ST key to prevent shunting down the relay on subsequent operation of the ST key.

The TKT1 relay extends ground to the Trunk Test (TT) circuit on the MC lead for later use to signal the TT circuit to close a connecting relay to the master test frame connector. The TKT1 relay furnishes ground through the operated OGT relay to operate the OGT relay in the trunk test circuit. The operated TKT1 relay furnishes resistance battery to operate N relay of the MTC. The N relay operates the N1 relay which locks to ground on the KR relay normal, grounds the STG lead to the trunk test circuit for operation of the ST relay of the trunk test circuit and closes start battery to the master test frame connector MTP lead.

MO-3.3 SELECTION OF A MARKER - SFD-J108

On OGT class of trunk test, the test circuit selects a marker by closing start battery on the MTP lead to the master test frame connector and operates the test preference relay (MTP) in that circuit which returns ground on the MKS lead when preceding relays in the preference chain are normal. The MKS ground feeds through back contacts of normal marker selection keys MT- or switches MTU- to the corresponding MKT- lead to operate MKT- relay in the connector for the marker selected. The connector makes the marker busy and, after verifying that the marker is normal, operates test relays in the marker, closes connector relays to the marker, and operates TS relay in the master test frame connector. This in turn grounds the TS lead to the MTC circuit.

MO-3.4 OPERATE CONNECTING AND TEST RELAYS

The grounded TS lead from the MTFC operates the Test Start (TS) relay which in turn operates the TS(1-10) relays. At the same time, the TS relay in the MTFC operates the MT test relay in the selected marker. The MT in turn operates other MT- relays in the marker. Some of them will depend on the keys and switches which are operated for the test. In addition various connecting relays which generally control input information into the marker will operate or will have operated by this time depending on the keys operated. A check path through contacts of these tests and connecting relays provides a ground to operate the MC relay of the MTC when all appropriate relays are operated. The MC in turn operates the MC1-8 relays. These relays cut through many of the leads to the MTC and also control additional connecting relays.

On an OGT class of test the following relays in the marker are always operated, MT, MT1, MT13, MT15, MT17, MT18, MT27, MT29, and MT56. Other test relays will operate if the associated keys are operated: MT4, MT14, MT24, with the FS key, MT9 with the NTFS key and MT5 and MT6 with TS key. The key connecting relays which operate on the OGT test are the KTS, KOR, KCS3, KCS6, KOS, if the OSS key is operated the KOSA and KOSG relays operate, KFS relay with FS key or KMT9 with NTFS key. The K, K1, and KA to KM relays with KY key or K2 with the TTL key.

MO-3.5 INPUT INFORMATION TO MARKER

With the test and connecting relays operated the markers given various input information that it would normally receive from the OR as well as additional control information.

The operated OTL1 relay grounds the FT0-3 FU0,1,2,4,7, VG0,1,2,4,7,10, HG0,1,2,4,7, and VF0-4 leads to which it is cross-connected to give the marker the originating test line location.

The operated OTL1 and KCS3 relay cut through class of service information.

The called number information is cut through in one of several ways depending on the keys and switches operated. With the KY key operated the called numbers set on the A0-9 to L0-9 keys is given to the marker.

If the TTL key is operated, the incoming trunk terminating test line number common to all offices in the area is passed to the marker. The office code set on the A0-9, B0-9 and C0-9 provides the full called number to the marker. If the office code consists of only 1 or 2 digits they are set respectively on the A0-9 or A0-9 and B0-9 switches. If no office code is used the A(0-9), B(0-9) and C(0-9) switches are left normal.

When the TTL2 relay operates, the thousands, hundreds, tens, and units digits cross-connected for the incoming trunk terminating test line number are shifted to immediately follow the office code digits whether the office code consists of none, one, two, or three digits. If there is no office code, the NA, NAl relays operate through normal contacts of the KA, KB, KC relays. With a one digit code the NB and NBl relays operate, two digits, the NC and NCl relays operate and with a three digit code, the ND and NDl relays operate. The set of relays that operate is determined by the KA, KB, KC relays. The KA, KB, KC relays operate in accordance with the A, B, C, digits or office code.

MO-3.6 SELECTION OF A PARTICULAR TRUNK

In order to direct a marker to select a particular trunk, the marker must be primed with information which will translate to operate a route relay which includes the desired trunk as part of its route. The called number keys A(0-9) through K(0-9) should be operated for a code whose route includes the desired trunk. The marker is directed by the FG(1,2) key and the FS(0-9) switch to select the trunk link on which the trunk appears. In the same manner the marker is directed to select a particular trunk within a 20 block by operation of one of the TSU(0-9) switch and the TSTl key for TS(10-19) appearances.

MO-3.6.1 NTFS Key Operated

The NTFS key, the FG(1,2) key, and one FS(0-9) switch are operated to select a particular trunk link frame without first testing for idle trunks on the frame and without testing for manual frame make-busy condition. This method of particular trunk link frame selection is required in order to allow the marker to connect to a trunk link frame on which all trunks of the desired group are plugged busy. The marker must be connected to the trunk link frame before it can operate a relay on that frame which allows the marker to select a plugged-busy trunk.

With the NTFS key operated, operation of the TKS relay operates the KMT9 relay which locks to the TKS relay, and operates the KF5 relay which also locks to the TK5 relay. The KF5 and MKT9 relays ground the MT3 and MT9 leads to operate test relays in the marker when the MT relay has been operated by the master test frame connector. The NTFS key operated, opens the operate path of the MC relay of the test circuit and requires that the proper test relays of the marker are operated before the MC relay can operate to allow the test circuit to prime the marker. (Similar to SFD-C507.)

The above test relays operated in the marker prevent the marker from making normal trunk link selection and instead prepare it to select the trunk link frame as it would on an incoming call from grounds on the FG(0-2) leads and the TF(0,1,2,4,7) leads on a 2/5 basis. The MC4 relay operates the KTF relay which closes grounds on the FG(0-2) leads and the TF(0,1,2,4,7) leads from contacts of the operated FG(0-2) key and FS(0-9) switch causing the marker to connect to the corresponding trunk link frame. (Similar to SFD C306.)

MO-3.6.2 Selection of Particular Trunk Within 20 Block - NTTS Key Operated

The NTTS key and TS0 switch are operated in order to restrict the marker to testing for that trunk of a 20 block corresponding to the operated TS0 switch and remove the busy condition from all trunks on the trunk link frame to which the marker connects in order to allow plugged-busy trunks to be selected.

Upon operation of the MC6 relay with the HMJA relay normal the NTTS key and the KTS relay operated. The TST lead is grounded. This lead is closed through the master test frame connector to the trunk link frame to which the marker is connected and operates the TST relay in the trunk link frame. This relay removes the manual make busy condition from all trunks on that trunk link frame. With the NTTS key operated, when the TST relay of the trunk link frame operates, it in turn operates the TSK relay to light the TSK lamp as an indication of satisfactory operation of the TST relay.

Wire spring markers use double wound relays, each of which operate from either an even or from the next higher numbered odd TS(0-19) switch position and, therefore, would permit the marker to select either of two trunks. To prevent this, test relay MTG in the marker opens the leads which permit the marker to prefer odd or even trunks and extends both ends of these leads to the master test control circuit as Even Trunk Selection and Odd Trunk Selection (OTS0 and OTS1). All even numbered TSU switch position connect ETS0 and ETS1 to permit selection of even trunks and all odd ones connect OTS0 to OST1 to permit selection of odd trunks.

MO-3.7 MARKER RELEASE

When the marker has completed setting up the connection it grounds the DCT lead operating the DCT relay of the MTC which, with the REC key normal, operates the MO1 relay to extend the DCT lead back to the marker to cause it to advance.

When the marker grounds the LK2 lead, the LK2 and DIS1 relay of the MTC are operated lighting the LK2 and DIS1 lamps. The marker grounds the MRL lead as a regular release signal, operating the MRL relay which lights the MRL lamp and operate the MFC relay. The MFC relay operates the MFC1 and these relays function to release the MTFC and part of the MTC. The RCY lead to the trunk test circuit is also grounded as a signal that the connection has been set.

MO-4 DESCRIPTION OF TRUNK TEST CIRCUIT OPERATION

On OGT class of trunk test the OGT relay operates in the trunk test circuit. When the start key of the master test control is released, the ST relay of the trunk test circuit operates.

After the marker has established network connection from the originating test line to the selected trunk, the AS relay is connected to the originating test line sleeve. The AS operates and operates lamp AS on the trunk test panel. Hence constant supervision of the sleeve condition during a test call is provided.

With the TLK key operated, a circuit is closed across the originating test line tip and ring. Included in this circuit are the PK relay, the E and F resistors, ST relay operated contacts and a coil in the telephone circuit. If polarity differs from normal battery on the ring relay PK will operate. If the loop is open or if the trunk circuit originating supervisory relay fails to operate on the loop condition the trunk circuit will not hold. Evidence of failure to hold is generally the extinguishing of the AS lamp.

In the OGT class of test the terminating supervisory circuit is connected to the terminating end of a simulated incoming trunk, consisting of IS, A, and T relays. This simulated trunk circuit is in turn connected to the outgoing trunk circuit under test. The ANS key controls terminating supervision. When operated it causes operation of ANS relay which connects a loop consisting of battery and ground from IS relay and the ANS transformer to operate the LK relay. The operation of LK relay connects tone on HT1 lead back through the trunk circuit and enables the test employee to roughly check the trunk's transmission.

MO-4.1 Test of Automatic Disconnect Features with Trunk Test Circuit

Since the TLK key controls originating supervision and the ANS key controls terminating supervision in the OGT class of trunk test, the automatic release feature with either the originating or terminating end disconnecting first can be checked by these keys. The automatic release of the terminating end (ANS key) should be 13 to 32 seconds. It is assumed that the thermal delay relay which controls the automatic release in the trunk has not been used for 4 minutes or more before the time test is made.

MO-5 TEST FRAME RELEASE

Operating the release key at any time operates the KR and KR1 relays which lock to make contacts on a number of relays in the test circuit to insure that the circuit restores to normal before another test can be started. The KR and KR1 relays remove normal grounds to which various relays of the test circuit have operated and locked.

The MFC1 relay is operated by the KR relay to release the master test frame connector by opening the start battery lead. On trunk test calls, the TKT relay is locked to ground on the N relay in addition to the operate ground from a back contact of the KR relay. If the trunk test circuit is off-normal, the TKT relay and the class-of-test relay in series with it are held operated until the trunk test circuit restores to normal and closes the battery furnished on the B lead to the N lead to operate the N relay. This allows the TKT, TKT1, and TKT2 relays and the class-of-test relay in series with the TKT relay to release. The class-of-test relay releases. No new test call can be started until the TKT relay releases to reclose the start lead from the ST key.

While the RL may be operated at any time, it is possible that a false trouble record may be produced if it is operated at certain intervals while the marker is still connected.

SECTION M, PART 1

INTRAOFFICE CLASS OF TRUNK TEST

Index

		<u>PAGE</u>
M1	INTRAOFFICE CLASS OF TRUNK TEST, GENERAL	M1-2
M1-1	TEST FRAME SET UP WITH CLASS OF TEST TABLE	M1-2
M1-2	SEQUENCE CHART IAO CLASS OF TRUNK TEST	M1-2
M1-3	IAO TRUNK TEST DESCRIPTION	M1-3
M1-3.1	IAO TEST PREPARATION	M1-3
M1-3.2	START OF IAO CLASS OF TRUNK TEST	M1-3
M1-3.3	SELECTION OF MARKER	M1-4
M1-3.4	OPERATION OF CONNECTING AND TEST RELAYS	M1-4
M1-3.5	INPUT INFORMATION TO MARKER	M1-4
M1-3.6	SELECTION OF PARTICULAR TRUNK	M1-5
M1-3.6.1	NTFS Key Operated	M1-5
M1-3.6.2	NTTS Key Operated	M1-6
M1-3.7	MARKER RELEASE	M1-6
M1-4	DESCRIPTION OF TRUNK TEST CIRCUIT OPERATION	
	IAO CLASS OF TEST	M1-7
M1-4.1	RINGING DETECTION WITH TERMINATING TEST LINE	M1-7
M1-4.2	TRIP AND PRETRIP TEST	M1-8
M1-4.3	TERMINATING SUPERVISION AND CONTINUITY	M1-8
M1-4.4	ANSWER AND DISCONNECT TESTING	M1-8
M1-4.5	AUTOMATIC DISCONNECT FEATURE	M1-9
M1-5	TEST FRAME RELEASE	M1-9

M1 INTRAOFFICE CLASS OF TRUNK TEST - GENERAL

The IAO class of trunk test is used for testing intraoffice trunks. A connection is set from the originating test line to the terminating test line. The Trunk Test (TT) circuit thus has control of both ends of the connection.

M1-1 TEST FRAME SET UP WITH CLASS-OF-TEST CHART

The class-of-test table summarizes in tabular form the key(s) and switch(es) used to establish an IAO class of trunk test on the chart. A single line across all columns is used to separate a particular function with its associated figure, option, key, or switch. The double line within the single lines is used to separate the various options on vintages of master test control frames. The note column and sheet notes are as follows:

- (a) Note 1 indicates that all key(s) or switch(es) must be operated to make a proper test frame set up for this particular class of test.
- (b) Note 2 indicates the key(s) or switch(es) to be used to simulate the trouble record. Refer to simulation tables in SFD-E902, E904, or E906 and their associated colored trouble record card on the opposite pages (E903, E905, or E907) or the simulated table selected. The tables and colored trouble record cards, along with the class-of-test tables, will assist the maintenance personnel in selecting the proper key(s) or switch(es) to be operated in order to properly simulate the reported trouble condition.
- (c) Note 3 indicates those key(s) or switch(es) used for additional marker tests, but they are not required for the trouble record test or a simulation test.

M1-2 SEQUENCE CHART - IAO CLASS (M104)

The sequence chart for the IAO class of trunk test is a combination of a sequence chart and a flowchart. It is designed to show the main functional interactions between the Master Test Control (MTC) circuit, the TT, the Master Test Frame Connector (MTFC) circuit and the Completing Marker (CM). Each double line box represents a particular circuit. The section and part of the SFD which provides full detail for the function is indicated within the box.

The overall progress of an IAO trunk test call is depicted by the flow from one functional box to the next. Within each box are skeletonized sequence chart depiction of the major progress points and information flow. In addition the keys and switches which are set up for the class of call are shown. The primary use of this chart is to show this overall progress of the call with key points of detail. It can be used to isolate a general trouble area if the test call fails in the set up stages.

M1-3 IAO TRUNK TEST DESCRIPTION

In the IAO class of trunk test the master test control circuit directs a marker to establish a connection from the originating test line to the originating end of the IAO trunk to be tested and from the terminating test line to the terminating side of the trunk under test. When this connection is established the trunk test circuit has control of both ends of the trunk under test and enables the various tests to be performed.

M1-3.1 IAO TEST PREPARATION

On the IAO class of trunk test, the master test control circuit primes the marker with the office code, dialed digits, class of service, trunk link appearance of the trunk to be tested and other necessary information detailed on the test frame test chart shown on SFD-M-102. In addition a telephone set should be plugged into the jacks of the master test frame telephone circuit and the TLK key should be operated.

M1-3.2 START OF IAO CLASS OF TRUNK TEST

Operating the ST key operates the ST relay (MTC) which closes ground through the operates TSTB (IAO) switch to operate the corresponding IAO relay. The operated IAO relay furnishes ground for the operation of the OTL1 relay which gives the marker the originating test line location.

Releasing the ST key removes the shunting ground from the winding of the IAO relay (SFD-J104) allowing it to operate in series with the previously operated IAO relay to ground furnished by KR relay. The TKT relay operates the TKT1 which operates the TKT2 relay. Operation of these relays opens the lead from the ST key to prevent shunting down the relay on subsequent operation of the ST key.

The TKT1 relay extends ground to the trunk test circuit on the MC lead for later use to signal the trunk test circuit to close a connecting relay to the master test frame connector. The operated TKT1 relay furnishes resistance battery to operate N relay of the MTC. The N relay operates the N1 relay which locks to ground on the KR relay normal, grounds the STG lead to the trunk test circuit for operation of the ST relay of the trunk test circuit and closes start battery to the master test frame connector MTP lead.

M1-3.3 SELECTION OF A MARKER

On IAO class of trunk test, the test circuit selects a marker by closing start battery on the MTP lead to the master test frame connector and operates the test preference relay (MTP) in that circuit which returns ground on the MKS lead when preceding relays in the preference chain are normal. The MKS ground feeds through back contacts of normal marker selection keys MT- or switches MTU- to the corresponding MKT- lead to operate MKT- relay in the connector for the marker selected. The connector makes the marker busy and, after verifying that the marker is normal, operates test relays in the marker, closes connector relays to the marker, and operates TS relay in the master test frame connector. This in turn grounds the TS lead to the MTC circuit.

M1-3.4 OPERATE CONNECTING AND TEST RELAYS

The grounded TS lead from the MTFC operates the Test Start (TS) relay which in turn operates the TS1-10 relays. At the same time, the TS relay in the MTFC operates the MT test relay in the selected marker. The MT in turn operates other MT- relays in the marker. Some of them will depend on the keys and switches which are operated for the test. In addition various connecting relays which generally control input information into the marker will operate or will have operated by this time depending on the keys operated. A check path through contacts of these tests and connecting relays provides a ground to operate the MC relay of the MTC when all appropriate relays are operated. The MC in turn operates the MC1-8 relays. These relays cut through many of the leads to the MTC and also control additional connecting relays.

On an IAO class of test, the following test relays are always operated: MT, MT1, MT11, MT13, MT15, MT17, MT18, MT27, MT29, MT56.

Other test relays will operate depending on the test frame test setup. These relays are: MT4, MT14, MT24 associated with the FS key, MT7, MT8 associated with the CH key and the MT9 relay associated with the NTFS key.

On an IAO class of test the following key connecting relays operate: KTS, KOR, KFS with the FS key operated, KMT9 with an operated NTFS key and with the KY key the following relays will operate: K, K1, KA-KM. If the TTL key is operated the K2 will operate.

M1-3.5 INPUT INFORMATION TO MARKER

With the test and connecting relays operated the marker is given various input information that it would normally receive from an originating register as well as additional control information.

The operated OTL1 relay grounds the FT0-3 FU-0,1,2,4,7, VG-0,1,2,4,7,10, HG-0,1,2,4,7 and VF-0-4 leads to which it is cross-connected to give the marker the originating test line location. The operated OTL1 and KCS3 relay cut through class of service information.

The called number information is cut through in one of several ways depending on the keys and switches operated. With the KY key operated the called numbers set on the A-0-9 to L-0-9 keys are given to the marker.

If the TTL key is operated, the terminating test line numbers of the trunk test circuit is passed to the marker through the TTL1 relay which is cross-connected to give the TH, HN, T, U information. The IAO code is set on the A(0-9), B(0-9), and C(0-9) keys or switches to provide the full called number to the marker.

M1-3.6 SELECTION OF A PARTICULAR TRUNK

In order to direct a marker to select a particular trunk, the marker must be primed with information to select the particular route relay associated with the IAO group of trunks. The A, B, C digits should be operated for the IAO code. The marker is directed by the FG(1,2) key and the FS(0-9) switch to select the trunk link on which the desired trunk appears. In the same manner the marker is directed to select a particular trunk within a 20 trunk block by operation of one of the TSU(0-9) switch and the TST1 key for TS-10-19 appearances.

M1-3.6.1 NTFS Key Operated

The NTFS key, the FG(1,2) key, and one FS(0-9) switch are operated to select a particular trunk link frame without first testing for idle trunks on the frame and without testing for manual frame make-busy condition. This method of particular trunk link frame selection is required in order to allow the marker to connect to a trunk link frame on which all trunks of the desired group are plugged busy. The marker must be connected to the trunk link frame before it can operate a relay on that frame which allows the marker to select a plugged-busy trunk.

With the NTFS key operated, operation of the TKS relay operates the KMT9 relay which locks to the TKS relay, and operates the KF5 relay which also locks to the TK5 relay. The KF5 and MKT9 relays ground the MT3 and MT9 leads to operate test relays in the marker when the MT relay has been operated by the master test frame connector. The NTFS key operated, opens the operate path of the MC relay of the test circuit and requires that the proper test relays of the marker are operated before the MC relay can operate to allow the test circuit to prime the marker. (Similar to SFD-C507.)

The above test relays operated in the marker prevent the marker from making normal trunk link selection and instead prepare it to select the trunk link frame as it would on an incoming call from grounds on the FG(0-2) leads and the TF(0,1,2,4,7) leads on a 2/5 basis. The MC4 relay operates the KTF relay which closes grounds on the FG(0-2) leads and the TF(0,1,2,4,7) leads from contacts of the operated FG(0-2) key and FS(0-9) switch causing the marker to connect to the corresponding trunk link frame. (Similar to SFD C306.)

M1-3.6.2 Selection of Particular Trunk Within 20 Block - NTTS Key Operated (Similar to SFD C309)

The NTTS key and TS0 switch are operated in order to restrict the marker to testing for that trunk of a 20 block corresponding to the operated TS0 switch and remove the busy condition from all trunks on the trunk link frame to which the marker connects in order to allow plugged-busy trunks to be selected.

Upon operation of the MC6 relay with the HMJA relay normal the NTTS key and the KTS relay operated. The TST lead is grounded. This lead is closed through the master test frame connector to the trunk link frame to which the marker is connected and operates the TST relay in the trunk link frame. This relay removes the manual make busy condition from all trunks on that trunk link frame. With the NTTS key operated, when the TST relay of the trunk link frame operates, it in turn operates the TSK relay to light the TSK lamp as an indication of satisfactory operation of the TST relay.

Wire spring markers use double wound relays, each of which operate from either an even or from the next higher numbered odd TS(0-19) switch position and, therefore, would permit the marker to select either of two trunks. To prevent this, test relay MTG in the marker opens the leads which permit the marker to prefer odd or even trunks and extends both ends of these leads to the master test control circuit as Even Trunk Selection (ETS0 and ETS1) and Odd Trunk Selection (OTS0 and OTS1). All even numbered TSU switch position connect ETS0 and ETS1 to permit selection of even trunks and all odd ones connect OTS0 to OTS1 to permit selection of odd trunks.

M1-3.7 MARKER RELEASE

A marker test relay operated in the marker on IAO test calls splits the DCT lead from the front contacts of the marker DCT relay. Both ends of the lead (DCT and TDCT) are brought into the test circuit through the contacts of the operated M01 relay. When the DCT of the CM operates, it operates the DCT relay of the test circuit which is a signal to the test circuit that the marker has completed all of its functions and is about to start the release of connecting circuits. The operation of the DCT relay of the test circuit operates the M01 relay. When the M01 relay

operates, it extends the DCT lead from the marker through contacts of the DCT relay operated to the TDCT lead to the marker. This action permits the CM to continue its normal release functions.

The marker grounds the MRL lead as a regular release signal, operating the MRL relay which lights the MRL lamp and operates the MFC relay. The MFC relay operates the MFCL and these relays function to release the MTFC and part of the MTC. The RC4 lead to the trunk test circuit is also grounded as a signal that the connection has been set.

M1-4 DESCRIPTION OF TRUNK TEST OPERATION IAO CLASS OF TEST

The master test control circuit has initiated the action necessary to prime the CM to establish a network connection. This network connection consists of the IAO trunk test on the MTF, the MTC, the originating test line, and the "A" appearance of the IAO trunk to be tested. The "B" appearance of the IAO trunk under test also has a network connection consisting of the terminating test line and the terminating portion of the IAO class of trunk test.

With the TLK key operated, a circuit is closed across the originating test line tip and ring. Included in this circuit are the PK relay, the E and F resistors, the operated ST relay contacts and the coil in the telephone circuit. If polarity differs from normal, battery on the ring, relay PK will operate. If the loop is open or if the trunk circuit originating supervisory relay fails to operate, the trunk circuit will not hold. Evidence of failure to hold is generally the extinguishing of the AS lamp.

M1-4.1 RINGING DETECTION WITH TERMINATING TEST LINE

The terminating portion of an IAO trunk test must be able to distinguish what side (TIP/RING) of a line the ringing appears, the code and, in offices with superimposed ringing, the polarity of D.C. potential. This feature is accomplished by the ringing detection circuits which enable the terminating position of the call to identify the coded ringing by lighting one of four lamps. Lamp (R-) shows a negative D.C. potential on the ring side, lamp (T-) a negative potential on the tip side. The positive D.C. potential is shown by the lamps (R+) and (T+) representing the ring and tip sides of the line.

These four lamps are operated by corresponding designated relays which operate through cathode tubes. Through a series of varistors, thermistors and resistors, correct ringing is identified by one of the four tubes operating which in turn operates its corresponding relay. The lighted lamp verifies the type of ringing applied.

M1-4.2 TRIP AND PRETRIP TEST

In an IAO trunk test on the terminating portion of the call, it is necessary to check the trunk for its ability to trip ringing only when the called subscriber answers. This test is accomplished through a series of resistors (P & Q) connected to the TIP/RING through the contacts of an operated TRP or PTP key.

To apply a pretrip test it is necessary to wait for the silent interval (extinguished R+, R-, T+, T- lamps). Momentarily operate the PTP key during a silent interval and release. It should be observed that the trunk did not trip ringing and the particular ringing lamp lights again. During the next silent interval the TRP key is momentarily operated and released. It should be observed that the ringing has been tripped and no ringing lamp occurs.

M1-4.3 TERMINATING SUPERVISION AND CONTINUITY

In the IAO class of trunk test, the connection is set up to the terminating test line. After ringing is tripped, the ANS key is operated which operates relay ANS. This relay connects a loop, consisting of resistors H and L, relay LK and the ANS transformer across the terminating loop. The resistance in this loop gives an operate test to the called party supervisory relay of the trunk circuit. At the same time relay LK checks the continuity of the loop. When it operates, it connects high tone back through the trunk circuit which checks the ability of the trunk circuit to transmit speech.

M1-4.4 IAO CLASS OF TRUNK TEST - ANSWER AND DISCONNECT TESTINGA. Answer Testing

When simulating a called customer answer on an IAO trunk test the ANS key is operated. The operation of the ANS key operates the ANS relay which lights the ANS lamp to verify the operation. The ANS relay closed a loop through the LK relay to the terminating test line. A check of transmission pair continuity is made when the LK relay operates to apply tone via the ANS relay. The tone indicates the ability of the trunk to transmit.

B. Disconnect Testing

When simulating calling customer disconnect the IAO test circuit will initiate this action by releasing the ANS relay. The release of the ANS relay opens the loop at the terminating test line releasing the LK and the CS relay in the trunk under test. When the trunk releases ground is removed from the sleeve leads releasing the AS and TS relays. This action operates the TC relay as an indication that the test is complete.

M1-4.1 TEST OF AUTOMATIC DISCONNECT FEATURES WITH TRUNK TEST CIRCUIT

Since the TLK key controls originating supervision and the ANS key controls terminating supervision in the 1A0 class of trunk test, the automatic release feature with either the originating or terminating end disconnecting first can be checked by these keys. The automatic release of the terminating end (ANS key) should be 13 to 32 seconds. It is assumed that the thermal delay relay which controls the automatic release in the trunk has not been used for 4 minutes or more before the time test is made.

M1-5 TEST FRAME RELEASE

Operating the release key at any time operates the KR and KR1 relays which lock to make contacts on a number of relays in the test circuit to insure that the circuit restores to normal before another test can be started. The KR and KR1 relays remove normal grounds to which various relays of the test circuit have operated and locked.

The MFC1 relay is operated by the KR relay to release the master test frame connector by opening the start battery lead. On trunk test calls, the TKT relay is locked to ground on the N relay in addition to the operate ground from a back contact of the KR relay. If the trunk test circuit is off-normal, the TKT relay and the class-of-test relay in series with it are held operated until the trunk test circuit restores to normal and closes the battery furnished on the B lead to the N lead to operate the N relay. This allows the TKT, TKT1, and TKT2 relays and the class-of-test relay in series with the TKT relay to release. The class-of-test relay releases. No new test call can be started until the TKT relay releases to reclose the start lead from the ST key.

While the RL may be operated at any time, it is possible that a false trouble record may be produced if it is operated at certain intervals while the marker is still connected.

SECTION M, PART 2

MISCELLANEOUS CLASS OF TRUNK TEST

Index

		<u>PAGE</u>
M2	MISC CLASS OF TRUNK TEST - GENERAL	M2-2
M2-1	TEST FRAME SET UP WITH CLASS-OF-TEST TABLE	M2-2
M2-2	SEQUENCE CHART, MISC CLASS OF TEST	M2-2
M2-3	MISC CLASS OF TRUNK TEST - DESCRIPTION	M2-3
M2-3.1	MISC CLASS OF TRUNK TEST - PREPARATION	M2-4
M2-3.2	START OF MISC TRUNK TEST	M2-4
M2-3.3	SELECTION OF MARKER	M2-4
M2-3.4	OPERATION OF CONNECTING AND TEST RELAYS	M2-5
M2-3.5	INPUT INFORMATION TO MARKER	M2-5
M2-3.6	SELECTION OF A PARTICULAR TRUNK	M2-6
M2-3.6.1	NTFS Key Operated	M2-6
M2-3.6.2	NTTS Key Operated	M2-7
M2-3.7	MARKER RELEASE	M2-7
M2-4	DESCRIPTION OF TRUNK TEST CIRCUIT, MISC CLASS OF TRUNK TEST	M2-8
M2-4.1	MISC CLASS OF TESTS/MISCELLANEOUS TRUNKS	M2-8
M2-4.2	MISC CLASS OF TESTS/OGT TRUNKS	M2-9
M2-5	TEST FRAME RELEASE	M2-11

M2 MISC CLASS OF TRUNK TEST - GENERAL

The MISC class of trunk test is primarily designed for testing miscellaneous types of trunks that are not furnished with TT relays but are selected by marker route relays. The MISC class of test is also used to test regular types of outgoing trunk circuits when the TT relays are not operated.

The MTC connects to the trunk test circuit, signals the trunk test circuit to prepare for miscellaneous class of test, and after receiving a signal that the trunk test circuit is normal, grounds its start lead and proceeds to connect to a marker (which, in turn, is directed to set up a connection from the originating test line to the trunk to be tested).

The test circuit functions as described for OGT class of test except the marker does not operate the TT relay in outgoing trunks, nor does it give an ND signal to senders. The connection is completed to a terminating office as directed by the dialed digits and class of service given to the marker.

A number of miscellaneous trunks may be tested with MISC class. These trunks are similar to outgoing trunks in that they have route relay assignments. They differ, however, in that they do not have TT relays.

M2-1 TEST FRAME SET UP WITH CLASS-OF-TEST CHART

The class-of-test table summarizes in tabular form the key(s) and switch(es) used to establish an MISC class of trunk test on the chart. A single line across all columns is used to separate a particular function with its associated figure, option, key, or switch. The double line within the single lines is used to separate the various options on vintages of master test control frames. The note column and sheet notes are as follows:

- (a) Note 1 indicates that all key(s) or switch(es) must be operated to make a proper test frame set up for this particular class of test.
- (b) Note 2 indicates the key(s) or switch(es) to be used to simulate the trouble record. Refer to simulation tables in SFD-C802, C804, or C806 and their associated colored trouble record card on the opposite pages (C803, C805, or C807) or the simulated table selected. The tables and colored trouble record cards, along with the class of test tables, will assist the maintenance personnel in selecting the proper key(s) or switch(es) to be operated in order to properly simulate the reported trouble condition.

- (c) Note 3 indicates those key(s) or switch(es) used for additional marker tests, but they are not required for the trouble record test or a simulation test.

M2-2 SEQUENCE CHART - MISC CLASS (M204)

The sequence chart for the MISC class of trunk test is a combination of a sequence chart and a flowchart. It is designed to show the main functional interactions between the Master Test Control (MTC) circuit, the Trunk Test (TT) circuit, the Master Test Frame Connector (MTFC) circuit and the Completing Marker (CM). Each double line box represents a particular circuit. The section and part of the SFD which provides full detail for the function is indicated within the box.

The overall progress of an MISC trunk test call is depicted by the flow from one functional box to the next. Within each box are skeletonized sequence chart depiction of the major progress points and information flow. In addition the keys and switches which are set up for the class of call are shown. The primary use of this chart is to show this overall progress of the call with key points of detail. It can be used to isolate a general trouble area if the test call fails in the set up stages.

M2-3 MISC CLASS OF TRUNK TEST DESCRIPTION

The trunks to be tested in the MISC class are similar to outgoing trunks in that they have route relay assignments. They differ however in that they do not have TT relays. In this class of test the originating test line is connected to the trunk circuit under test via a regular channel. Therefore, the originating supervision, coin, originating sleeve supervision ringing bridge, dialing, and talking circuits can be used in testing the MISC trunk circuits. In cases where the trunk is to an attendant, the services of the latter are required.

It is also possible to test outgoing trunks which do have TT relays in the MISC class. In this case the TT relay is not operated and the trunk is switched to a connection in the distant office. This class is used for example on transmission tests where it is desired to not alter the transmission path by switching it back to the trunk test circuit via the trunk test multiple.

M2-3.1 MISC CLASS OF TRUNK TEST PREPARATION

On the MISC class of trunk test, the MTC simulates on originating register and primes the marker with the code, digits, local translation, class of service, and selected trunk information. The keys and switches necessary for MISC class of tests are shown on sheets M202 and M203. In the MISC class of test, the marker does not operate a TT relay nor does it give a N.D. signal to senders. The connection is completed to wherever it is directed by the operation of the route relay assigned to the particular trunk under test. In addition, a telset should be plugged into the jacks of the master test frame tel circuit and the TLK key should be operated.

M2-3.2 START OF MISC CLASS OF TRUNK TEST

Operating the ST key operates the ST relay (MTC) which closes ground through the operated TSTB (MISC) switch to operate the corresponding MISC relay. The operated MISC relay furnishes ground for the operation of the OTL1 relay which gives the marker the originating test line location.

Releasing the ST key removes the shunting ground from the winding of the TRK relay (SFD-J104) allowing it to operate in series with the previously operated MISC relay to ground furnished by KR relay. The TKT relay operates the TKT1 which operates the TKT2 relay. Operation of these relays opens the lead from the ST key to prevent shunting down the relay on subsequent operation of the ST key.

The TKT1 relay extends ground to the TT circuit on the MC lead for later use to signal the trunk test circuit to close a connecting relay to the master test frame connector. The TKT1 relay furnishes ground through the operated MISC relay to operate the MISC relay in the trunk test circuit. The operated TKT1 relay furnishes resistance battery to operate N relay of the MTC. The N relay operates the N1 relay which locks to ground on the KR relay normal, grounds the STG lead to the trunk test circuit for operation of the ST relay of the trunk test circuit and closes start battery to the master test frame connector MTP lead.

M2-3.3 SELECTION OF A MARKER - SFD-J108

On MISC class of trunk test, the test circuit selects a marker by closing start battery on the MTP lead to the master test frame connector and operates the test preference relay (MTP) in that circuit which returns ground on the MKS lead when preceding relays in the preference chain are normal. The MKS ground feeds through back contacts of normal marker selection keys MT- or switches MTU- to the corresponding MKT- lead to operate MKT- relay in the connector for the marker selected. The connector makes the marker busy and, after verifying that the marker is normal, operates test relays in the marker, closes connector relays to the marker, and operates TS relay in the master test frame connector. This in turn grounds the TS lead to the MTC circuit.

M2-3.4 OPERATION OF CONNECTING AND TEST RELAYS

On a MISC class of test the following test relays are always operated: MT, MT1, MT11, MT13, MT15, MT17, MT18, MT27, MT29, MT56.

Other test relays will operate if the associated keys are operated: MT2-OSS key, MT4, MT14, MT24-FS key, MT7, MT8-Ch key, MT5, MT6 TS Key, MT9-NTFS Key.

On a misc class of test the following key connecting relays operate: KTS, KOR, KFS, with FS Key, KOSA, KOSG with OSS Key, KMT9 with NTFS Key. If KY key is operated, the following relays will operate K, K1, and the KA-KM relays (A-L) digits. If the TTL Key is operated the K2 relay will operate.

M2-3.5 INPUT INFORMATION TO MARKER

With the test and connecting relays operated the markers give various input information that it would normally receive from the OR as well as additional control information.

The operated OTL1 relay grounds the FT0-3 FU0,1,2,4,7, VG0,1,2,4,7,10, HG0,1,2,4,7 and VF0-4 leads to which it is cross-connected to give the marker the originating test line location.

The operated OTL1 and KCS3 relay cut through class-of-service information.

The called number information is cut through in one of several ways depending on the keys and switches operated. With the KY key operated the called numbers set on the A0-9 to L0-9 keys is given to the marker.

If the TTL key is operated the incoming trunk terminating test line number common to all offices in the area is passed to the marker. The office code set on the A0-9, B0-9 and C0-9 provides the full called number to the marker. If the office code consists of only 1 or 2 digits they are set respectively on the A0-9 or A0-9 and B0-9 switches. If no office code is used the A-, B- and C- switches are left normal.

In a MISC class with the TTL key operated, the TTL2 relay will operate, enabling the TH, HN, T, U, digits cross-connected for the incoming trunk terminating test line to follow the office code digits, whether the office code consists of none, one, two or three digits. This is accomplished by the operation of the KA, KB, KC relays which are operated through the ABC, digits of an office code. If there is no office code, the NA, NAl relays operate through normal contacts of KA, KB, KC, and close ground through the TH cross-connection to A(0,1,2,4,7) leads, HN to the B(0,1,2,4,7) TN to the C(0,1,2,4,7) and U to the D(0,1,2,4,7) leads and ground

the E 7 lead. The NB and NB1 relays shift the TH, HN, TN, U to the B,C,D,E(0,1,2,4,7) leads and grounds the F7 lead. The NC and NC1 relays shift the TH, HN, TN, U to the C,D,E,F(0,1,2,4,7) leads and ground the G7 lead. The ND and ND1 relays shift the TH, H, T, U to the D,E,F,G(0,1,2,4,7) leads and grounds the H7 lead.

M2-3.6 SELECTION OF A PARTICULAR TRUNK

In order to direct a marker to select a particular trunk, the marker must be primed with information which will translate to operate a route relay which includes the desired trunk as part of its route. The called number keys A(0-9) through K(0-9) should be operated for a code whose route includes the desired trunk. The marker is directed by the FG(1,2) key and the FS(0-9) switch to select the trunk link on which the trunk appears. In the same manner the marker is directed to select a particular trunk within a 20 block by operation of one of the TSU(0-9) switch and the TST1 key for TS10-19 appearances.

M2-3.6.1 NTFS Key Operated

The NTFS key, the FG(1,2) key, and one FS(0-9) switch are operated to select a particular trunk link frame without first testing for idle trunks on the frame and without testing for manual frame make-busy condition. This method of particular trunk link frame selection is required in order to allow the marker to connect to a trunk link frame on which all trunks of the desired group are plugged busy. The marker must be connected to the trunk link frame before it can operate a relay on that frame which allows the marker to select a plugged-busy trunk.

With the NTFS key operated, operation of the TKS relay operates the KMT9 relay which locks to the TKS relay, and operates the KF5 relay which also locks to the TK5 relay. The KF5 and MKT9 relays ground the MT3 and MT9 leads to operate test relays in the marker when the MT relay has been operated by the master test frame connector. The NTFS key operated, opens the operate path of the MC relay of the test circuit and requires that the proper test relays of the marker are operated before the MC relay can operate to allow the test circuit to prime the marker. (Similar to SFD-C507.)

The above test relays operated in the marker prevent the marker from making normal trunk link selection and instead prepare it to select the trunk link frame as it would on an incoming call from grounds on the FG(0-2) leads and the TF(0,1,2,4,7) leads on a 2/5 basis. The MC4 relay operates the KTF relay which closes grounds on the FG(0-2) leads and the TF(0,1,2,4,7) leads from contacts of the operated FG(0-2) key and FS(0-9) switch causing the marker to connect to the corresponding trunk link frame. (Similar to SFD C306.)

M2-3.6.2 Selection of Particular Trunk Within 20 Block - NTTS Key Operated

The NTTS key and TSO switch are operated in order to restrict the marker to testing for that trunk of a 20 block corresponding to the operated TSO switch and remove the busy condition from all trunks on the trunk link frame to which the marker connects in order to allow plugged-busy trunks to be selected.

Upon operation of the MC6 relay with the HMJA relay normal the NTTS key and the KTS relay operated. The TST lead is grounded. This lead is closed through the master test frame connector to the trunk link frame to which the marker is connected and operates the TST relay in the trunk link frame. This relay removes the manual make busy condition from all trunks on that trunk link frame. With the NTTS key operated, when the TST relay of the trunk link frame operates, it in turn operates the TSK relay to light the TSK lamp as an indication of satisfactory operation of the TST relay.

Wire spring markers use double wound relays, each of which operate from either an even or from the next higher numbered odd TS(0-19) switch position and, therefore, would permit the marker to select either of two trunks. To prevent this, test relay MTG in the marker opens the leads which permit the marker to prefer odd or even trunks and extends both ends of these leads to the master test control circuit as Even Trunk Selection (ETSO and ETS1) and Odd Trunk Selection (OTS0 and OTS1). All even numbered TSU switch position connect ETS0 and ETS1 to permit selection of even trunks and all odd ones connect OTS0 to OTS1 to permit selection of odd trunks.

M2-3.7 MARKER RELEASE

When the marker has completed setting up the connection it grounds the DCT lead operating the DCT relay of the MTC which, with the REC key normal, operates the M01 relay to extend the DCT lead back to the marker to cause it to advance.

When the marker grounds the LK2 lead, the LK2 and DIS1 relay of the MTC are operated lighting the LK2 and DIS1 lamps. The marker grounds the MRL lead as a regular release signal, operating the MRL relay which lights the MRL lamp and operate the MFC relay. The MFC relay operates the MFC1 and these relays function to release the MFC and part of the MTC. The RCY lead to the trunk test circuit is also grounded as a signal that the connection has been set.

M2-4 DESCRIPTION OF TRUNK TEST CIRCUIT, MISCELLANEOUS CLASS OF TRUNK TEST

After the marker has established network connection from the originating test line to the selected trunk, the AS relay is connected to the originating test line sleeve. The AS operates and operates lamp AS on the trunk test panel. Hence, constant supervision of the sleeve condition during a test call is provided. With the TLK key operated, a circuit is closed across the originating test line tip and ring leads. Included in this circuit are the PK relay, the E and F resistors, ST relay operated contacts and a coil in the telephone circuit. If the loop is open or if the trunk circuit originating supervisory relay fails to operate on the loop condition, the trunk circuit will not hold. Evidence of failure to hold is generally the extinguishing of the AS lamp. This test can be applied to MISC trunks not furnished with TT relays, but selected by marker route relays and OGT trunks where the TT relay does not operate. The connection is completed to a terminating office as directed by the dialed digits and class of service given to the marker.

M2-4.1 MISC CLASS OF TESTS/MISC TRUNKS

A number of MISC trunks may be tested with the MISC class. These trunks are similar to OGT trunks in that they have a route relay assignment but differ in that they do not have TT relays. Since the misc trunks complete to a termination associated with their assigned route relays; the primary tests performed are those in which verification is acknowledged by the trunks completion to a particular route and the ability to transmit or receive over the channel established by the marker. As such, no detailed procedure is provided in the misc class. The trunks generally used in this class are:

- 1) Recording Completing Special Service or Vacant Code
- 2) Tone or Partial Dial Trunk Circuit
- 3) Trunk to Test Desk
- 4) Repair or Information Trunk Circuit
- 5) Permanent Signal Holding Trunk Circuit
- 6) Common Overflow Trunk Circuit
- 7) Revertive Ringing Trunk Circuit
- 8) Station Ringer Test Circuit
- 9) Stuck Coin Trunk Circuit

Various tests applicable to some of the MISC trunks are as follows:

The originating test line is connected to the trunk circuit under test using a regular channel. The originating supervision, coin, originating sleeve supervision, ringing bridge, dialing, and talking circuits can be used in testing the miscellaneous trunk circuits.

No detailed procedure will be provided in this SCD for testing the miscellaneous trunk circuits because most of the required tests are obvious. However, some of the unusual features will be discussed.

In testing noncoin recording completing trunks, the PK lamp should not light until the attendant answers. The attendant should be able to bring in the R- lamp by ringing back on the connection with the TLK key operated. In testing coin recording completing trunks, the attendant should be able to provide coin collect and return pulses to the trunk test circuit.

Associated with permanent signal holding trunks, tests can be made of the permanent signal concentrating circuit features such as ringing, coin control, and howler application. The permanent signal holding circuit has a timeout feature which causes the associated line lamp at the test frame to change from a steadily lighted condition to a flashing condition. The timeout can be speeded up by operating key PS1/PS2 first to position PS1 and then to position PS2.

In testing revertive ringing trunk circuits, the RVC key should be operated to connect the gas tube ringing detection circuit to the originating tip and ring so that ringing can be checked.

When testing MISC class of test on regular outgoing trunks or on other types of miscellaneous trunks it is always advisable to use the BSP sections for proper key and lamp operations for any trunk circuit being tested.

M2-4.2 MISC CLASS OF TESTS/OGT TRUNKS

The MISC class of test is used for testing outgoing trunk circuits when it is desired to establish a connection between the trunk selected and a distant office via the office code, number of digits, class of service, and local translation on the keys and switches operated on the master test frame. For these tests, the trunk TT relay remains nonoperated. The OGT trunk under test will be connected to a precision transmission test line. This transmission test line will automatically trip ringing and connect the trunk to a transmission test line with milliwatt supply. Some of the tests applicable to the OGT/MISC class of test are as follows.

1. ONE WAY TRANSMISSION TESTS

Transmission tests to local offices on 2-wire trunks that are either nonrepeaters or use E- type repeaters are tested from the master test control frame using MISC class of test. These types of trunks are referred to as one-way transmission measurements. The TM1 jack of the master test frame jack, lamp, and key circuit is patched to the test termination circuit. A transmission measuring set is connected to the test terminating circuit. Operation of the master test control circuit start key initiates a connection to the distant office transmission test line. When the connection is established, 1000-cycle tone will be heard in the master test frame telephone set. To measure the loss on the circuit, a test key in the test termination circuit is operated and a transmission measuring set is connected to the REC1 jack. The TM1 key associated with the TM1 jack of the master test frame jack, lamp, and key circuit is operated, which cuts off the master test frame telephone circuit and cuts through the trunk test circuits tip and ring to the measuring test set. The 1000-cycle tone can now be measured on a Far-to-Near (F-N) basis.

2. TWO WAY TRANSMISSION TESTS

Transmission tests to local offices, on trunks which operate with carriers of 4-wire facilities, are tested from the master test control frame using MISC class of test. These types of trunks are referred to as 2-way transmission measurements, performed on a loop-around type of test. Trunks of this type, which may have different losses in the two directions of transmission, are tested in two steps.

Step 1 consists of making a F-N transmission test as described in C8-10.1.

Patch cords are arranged to connect the TM1 and TM2 jacks to the auxiliary jack (TRK2) and the regular jack (TRK1) respectively of the test termination circuit. The measuring set is connected to the auxiliary jack (REC2) of the test termination circuit and the milliwatt supply is connected to the regular jack (SD) of the test termination circuit.

A connection is established to the first loop-around test line at the distant office via a reference trunk (1st APP). Test keys are operated in the auxiliary termination circuit and the master test frame jack, lamp, and key circuit to cut through the transmission path and return ground via the sleeve of the TM1 jack to operate relay TM1 in the trunk test circuit. Relay TM1 transfers the telephone circuit to the tip and ring of the originating test line and grounds the TM1 lead to the master test control circuit for use in Step 2 of the tests. The connection is held from the auxiliary termination circuit independent of the master test control circuit which is then released. The trunk to be tested (2nd APP) and the second loop-around test line number are then selected at the master test control circuit.

Step 2 is initiated by operation of the control start key. Ground on lead TM1 causes the control circuit to change marker priming information pertaining to the calling line location to that of the combined originating and terminating test line. A connection is, therefore, established from the telephone circuit via the combined test line to the second loop around test line location at the remote office.

Operation of test keys in the test termination circuit will now cut through the milliwatt supply transmission path and extend ground via the TM2 jack to operate relay TM2. Relay TM2 cuts off the telephone circuit and cuts through the tip and ring from the test termination circuit to the combined test line.

The loss, as measured in Step 2, is the sum of the F-N loss of trunk (1st APP) and the N-F loss of trunk (2nd APP). Subtracting the loss measured in Step 1 now gives the value of the N-F loss for trunk (2nd APP).

M1-5 TEST FRAME RELEASE

Operating the release key at any time operates the KR and KR1 relays which lock to make contacts on a number of relays in the test circuit to insure that the circuit restores to normal before another test can be started. The KR and KR1 relays remove normal grounds to which various relays of the test circuit have operated and locked.

The MFC1 relay is operated by the KR relay to release the master test frame connector by opening the start battery lead. On trunk test calls, the TKT relay is locked to ground on the N relay in addition to the operate ground from a back contact of the KR relay. If the trunk test circuit is off-normal, the TKT relay and the class-of-test relay in series with it are held operated until the trunk test circuit restores to normal and closes the battery furnished on the B lead to the N lead to operate the N relay. This allows the TKT, TKT1, and TKT2 relays and the class-of-test relay in series with the TKT relay to release. The class-of-test relay releases. No new test call can be started until the TKT relay releases to reclose the start lead from the ST key.

While the RL may be operated at any time, it is possible that a false trouble record may be produced if it is operated at certain intervals while the marker is still connected.

SECTION M, PART 3

INCOMING TRUNK IN DISTANT OFFICE -
CLASS OF TRUNK TEST (ITDO)

(Index)

		<u>PAGE</u>
M3	ITDO CLASS OF TRUNK TEST - GENERAL	M3-2
M3-1	TEST FRAME SET UP WITH CLASS-OF-TEST CHART	M3-2
M3-2	SEQUENCE CHART, ITDO CLASS OF TEST	M3-2
M3-3	IDTO CLASS OF TRUNK TEST - DESCRIPTION	M3-3
M3-3.1	ITDO CLASS OF TRUNK TEST - PREPARATION	M3-3
M3-3.2	START OF ITDO TRUNK TEST	M3-4
M3-3.3	SELECTION OF MARKER	M3-4
M3-3.4	OPERATION OF CONNECTING AND TEST RELAYS	M3-4
M3-3.5	INPUT INFORMATION TO MARKER	M3-5
M3-3.6	SELECTION OF PARTICULAR TRUNK	M3-5
M3-3.6.1	NTFS Key Operated	M3-6
M3-3.6.2	NTTS Key Operated	M3-6
M3-3.7	MARKER RELEASE	M3-7
M3-4	DESCRIPTION OF TRUNK TEST CIRCUIT, OPERATION OF ITDO CLASS	M3-7
M3-5	TEST FRAME RELEASE	M3-8

M3 ITDO CLASS OF TRUNK TEST - GENERAL

The ITDO class of trunk test is used for testing certain features of incoming trunks in distant offices. A connection is established from the originating test line to an outgoing trunk. The call is devoted to a test line in the distant office. The TT relay of the outgoing trunk is operated but the TIP/RING leads are extended back through the trunk test multiple to the trunk facility. The CS lead from the trunk through the trunk TT relay and the trunk test multiple allows supervision from the distant end to be monitored.

M3-1 TEST FRAME SET UP WITH CLASS-OF-TEST CHART

The class-of-test table summarizes in tabular form the key(s) and switch(es) used to establish an ITDO class of trunk test on the chart. A single line across all columns is used to separate a particular function with its associated figure, option, key, or switch. The double line within the single lines is used to separate the various options on vintages of master test control frames. The note column and sheet notes are as follows:

- (a) Note 1 indicates that all key(s) or switch(es) must be operated to make a proper test frame set up for this particular class of test.
- (b) Note 2 indicates the key(s) or switch(es) to be used to simulate the trouble record. Refer to simulation tables in SFD-C802, C804, or C806 and their associated colored trouble record card on the opposite pages (C803, C805, or C807) or the simulated table selected. The tables and colored trouble record cards, along with the class of test tables, will assist the maintenance personnel in selecting the proper key(s) or switch(es) to be operated in order to properly simulate the reported trouble condition.
- (c) Note 3 indicates those key(s) or switch(es) used for additional marker tests, but they are not required for the trouble record test or a simulation test.

M3-2 SEQUENCE CHART - ITDO CLASS (M304)

The sequence chart for the ITDO class of trunk test is a combination of a sequence chart and a flow chart. It is designed to show the main functional interactions between the Master Test Control (MTC) circuit, the Trunk Test (TT) circuit, the Master Test Frame Connector (MTFC)

circuit and the Completing Marker (CM). Each double line box represents a particular circuit. The section and part of the SFD which provides full detail for the function is indicated within the box.

The overall progress of an ITDO trunk test call is depicted by the flow from one functional box to the next. Within each box are skeletonized sequence chart depiction of the major progress points and information flow. In addition the keys and switches which are set up for the class of call are shown. The primary use of this chart is to show this overall progress of the call with key points of detail. It can be used to isolate a general trouble area if the test call fails in the set up stages.

M3-3 ITDO CLASS OF TRUNK TEST - DESCRIPTION

The ITDO class of trunk test is used for testing certain features of incoming trunks in distant offices. This class of test consists of a combination of an outgoing trunk circuit (in the office with the test circuit) and the incoming trunk circuit in the distant office. The information for setting up the call is passed from the MTC circuit to the marker via the MTFC circuit in the same manner that an OR passes information to the marker.

The TT relay is operated in the OGT circuit by the grounded TT lead from the MKR. With the TT relay operated, the outgoing TIP and RING leads (T0 and R0) are connected through the operated TT, TTM, and ITDO relay and the A and B resistors of the trunk test circuit to the TIP and RING (T1-R1) leads of the distant incoming trunk. This enables the trunk test circuit to gain access to the outgoing portion of the OGT and the tip and ring of the distant incoming trunk.

The sender which the marker connects to the outgoing trunk is primed with the number to which the incoming trunk is to be directed. Pulses from the sender, direct the setting up of the connection in the distant office to the incoming trunk test line.

M3-3.1 ITDO CLASS OF TRUNK TEST - PREPARATION

On ITDO class of trunk test the master test control circuit primes the marker with the code, digits, translation, and local translation 2 class of service and selected trunk information. This information, except for trunk selection information is normally received by the marker from the originating register. Keys and switches are set to provide this information shown on the test frame set up of the ITDO class of test SFD M302, M303. In addition a telephone set should be plugged into the jacks of the master test frame telephone circuit and the TLK key should be operated.

M3-3.2 START OF ITDO TRUNK TEST

Operating the ST key operates the ST relay (MTC) which closes ground through the operated ITDO switch to operate the corresponding ITDO relay. The operated ITDO relay furnishes ground for the operation of the OTL1 relay which gives the marker the originating test line location. It also furnishes ground on the OTT lead to signal the marker to operate the TT relay in the outgoing trunk. The N relay operates the N1 relay which locks to ground on the KR relay normal, grounds the STG lead to the trunk test circuit and operates a traffic register over the PCT lead and closes start battery to MTFC MTP lead.

M3-3.3 SELECTION OF A MARKER - SFD-J108

On OGT class of trunk test, the test circuit selects a marker by closing start battery on the MTP lead to the master test frame connector and operates the test preference relay (MTP) in that circuit which returns ground on the MKS lead when preceding relays in the preference chain are normal. The MKS ground feeds through back contacts of normal marker selection keys MT- or switches MTU- to the corresponding MKT- lead to operate MKT- relay in the connector for the marker selected. The connector makes the marker busy and, after verifying that the marker is normal, operates test relays in the marker, closes connector relays to the marker, and operates TS relay in the MTFC. This in turn grounds the TS lead to the MTC circuit.

M3-3.4 . OPERATE CONNECTING AND TEST RELAYS

The grounded TS lead from the MTFC operates the Test Start (TS) relay which in turn operates the TS(1-10) relays. At the same time, the TS relay in the MTFC operates the MT test relay in the selected marker. The MT in turn operates other MT- relays in the marker. Some of them will depend on the keys and switches which are operated for the test.

In addition various connecting relays which generally control input information into the marker will operate or will have operated by this time depending on the keys operated. A check path through contacts of these tests and connecting relays provides a ground to operate the MC relay of the MTC when all appropriate relays are operated. The MC in turn operates the MC1-8 relays. These relays cut through many of the leads to the MTC and also control additional connecting relays.

On the ITDO class of trunk test the following test relays are always operated: MT, MT1, MT11, MT13, MT15, MT17, MT18, MT27, MT29, MT56.

Other test relays will operate if the associated keys necessary for the particular type of test are operated: MT4, MT14, MT24-FS Key, MT5, MT6-TS Key, MT9-NTFS Key.

On the ITDO class of test, the following key connecting relays operate, KTS, KOR, KFS with FS Key, KMT9, with NTFS key. If KY key is operated, the following relays will operate, K, K1, and the KA-KM relays depending upon the amount of digits needed. If the TTL key is operated the K2 relay will operate.

M3-3.5 INPUT INFORMATION TO MARKER

With the test and connecting relays operated the markers give various input information that it would normally receive from the OR as well as additional control information.

The operated OTL1 relay grounds the FT0-3 FU0,1,2,4,7, VG0,1,2,4,7,10, HG0,1,2,4,7 and VF0-4 leads to which it is crossconnected to give the marker the originating test line location.

The operated OTL1 and KCS3 relay cut through class-of-service information.

The called number information is cut through in one of several ways depending on the keys and switches operated. With the KY key operated the called numbers set on the A0-9 to L0-9 keys is given to the marker.

If the TTL key is operated the incoming trunk terminating test line number common to all offices in the area is passed to the marker. The office code set on the A0-9, B0-9, and C0-9 provides the full called number to the marker. If the office code consists of only 1 or 2 digits they are set respectively on the A0-9 or A0-9 and B0-9 switches. If no office code is used the A(0-9), B(0-9), C(0-9) switches are left normal.

In an IDTO class with the TTL key operated the TTL2 relay will operate enabling the TH, HN, T, U digits cross-connected for the incoming trunk terminating test line to follow the office code digits, whether the office code consists of none, one, two or three digits. This is accomplished by the operation of the KA, KB, KC relays which are operated through the A, B, C digits of an office code. If there is no office code, the NA, NA1 relays operate through normal contacts of KA, KB, KC. With one digit the NB and NB1 relay operate, two digits the NC and NC1 relays operate three digits, the ND and ND1 relays operate.

M3-3.6 SELECTION OF A PARTICULAR TRUNK

In order to direct a marker to select a particular trunk, the marker must be primed with information which will translate to operate a route relay which includes the desired trunk as part of its route. The called number keys A(0-9) through K(0-9) should be operated for a code whose route includes the desired trunk. The marker is directed by the FG(1,2) key and the FS(0-9) switch to select the trunk link on which the trunk appears. In the same manner the marker is directed to select a particular trunk within a 20 block by operation of one of the TSU(0-9) switch and the TST1 key for TS10-19 appearances.

M3-3.6.1 NTFS Key Operated

The NTFS key, the FG(1,2) key, and one FS(0-9) switch are operated to select a particular trunk link frame without first testing for idle trunks on the frame and without testing for manual frame make-busy condition. This method of particular trunk link frame selection is required in order to allow the marker to connect to a trunk link frame on which all trunks of the desired group are plugged busy. The marker must be connected to the trunk link frame before it can operate a relay on that frame which allows the marker to select a plugged-busy trunk.

With the NTFS key operated, operation of the TKS relay operates the KMT9 relay which locks to the TKS relay, and operates the KF5 relay which also locks to the TK5 relay. The KF5 and MKT9 relays ground the MT3 and MT9 leads to operate test relays in the marker when the MT relay has been operated by the MTFC. The NTFS key operated, opens the operate path of the MC relay of the test circuit and requires that the proper test relays of the marker are operated before the MC relay can operate to allow the test circuit to prime the marker. (Similar to SFD-C507.)

The above test relays operated in the marker prevent the marker from making normal trunk link selection and instead prepare it to select the trunk link frame as it would on an incoming call from grounds on the FG(0-2) leads and the TF(0,1,2,4,7) leads on a 2/5 basis. The MC4 relay operates the KTF relay which closes grounds on the FG(0-2) leads and the TF(0,1,2,4,7) leads from contacts of the operated FG(0-2) key and FS(0-9) switch causing the marker to connect to the corresponding trunk link frame. (Similar to SFD C306.)

M3-3.6.2 NTTS Key Operated

The NTTS key and TS0 switch are operated in order to restrict the marker to testing for that trunk of a 20 block corresponding to the operated TS0 switch and remove the busy condition from all trunks on the trunk link frame to which the marker connects in order to allow plugged-busy trunks to be selected.

Upon operation of the MC6 relay with the HMJA relay normal the NTTS key and the KTS relay operated. The TST lead is grounded. This lead is closed through the master test frame connector to the trunk link frame to which the marker is connected and operates the TST relay in the trunk link frame. This relay removes the manual make busy condition from all trunks on that trunk link frame. With the NTTS key operated, when the TST relay of the trunk link frame operates, it in turn operates the TSK relay to light the TSK lamp as an indication of satisfactory operation of the TST relay.

Wire spring markers use double wound relays, each of which operate from either an even or from the next higher numbered odd TS(0-19) switch position and, therefore, would permit the marker to select either of two trunks. To prevent this, test relay MTG in the marker opens the leads which permit the marker to prefer odd or even trunks and extends both ends of these leads to the master test control circuit as Even Trunk Selection (ETS0 and ETS1) and Odd Trunk Selection (OTS0 and OTS1). All even numbered TSU switch position connect ETS0 and ETS1 to permit selection of even trunks and all odd ones connect OTS0 to OTS1 to permit selection of odd trunks.

M3-3.7 MARKER RELEASE

When the marker has completed setting up the connection it grounds the DCT lead operating the DCT relay of the MTC which, with the REC key normal, operates the MO1 relay to extend the DCT lead back to the marker to cause it to advance.

When the marker grounds the LK2 lead, the LK2 and DIS1 relay of the MTC are operated lighting the LK2 and DIS1 lamps. The marker grounds the MRL lead as a regular release signal, operating the MRL relay which lights the MRL lamp and operate the MFC relay. The MFC relay operates the MFC1 and these relays function to release the MTFC and part of the MTC. The RCY lead to the trunk test circuit is also grounded as a signal that the connection has been set.

M3-4 DESCRIPTION OF TRUNK TEST CIRCUIT OPERATION - ITDO CLASS OF TEST

The chief purpose of ITDO class of trunk test is to test the incoming trunk features in the distant office. For this class of test the marker operates the TT relay in the outgoing trunk circuit. The ST, ITDO, and MC relays operate in the trunk test circuit. The TLK key should be operated before start of test.

After the marker performs its functions the following setup exists. The originating test line with its associated originating supervision circuit is connected through a regular channel to the outgoing trunk circuit associated with the incoming trunk circuit under test. The TT relay in the outgoing trunk circuit being operated, the trunk circuit outgoing tip and ring leads, T0 and R0 are connected through front contacts of the ITDO relay and the A and B resistors to the trunk connectors tip and ring, T1 and R1, respectively. In other words the A and B resistors are inserted in series with the outgoing loop. The ITDO relay also connects the front contact of the CS relay of the outgoing trunk circuit to the OGT-CS lamp.

The outgoing sender is caused to set up the call to an incoming trunk test in the distant office. This test line trips ringing and sends back flashing supervision and tones. The OGT-CS lamp should follow the flashing supervision. This flashing supervision is of such a nature that it should not cause charge conditions to be setup in the outgoing trunk circuits.

Although this class of test is primarily for testing the trunk circuits in the distant office, noncharge features of the outgoing trunk circuit are tested as a by-product. For this reason the tests may be made simulating flat rate, AMA, or message rate calls.

M3-5 TEST FRAME RELEASE

Operating the release key at any time operates the KR and KR1 relays which lock to make contacts on a number of relays in the test circuit to insure that the circuit restores to normal before another test can be started. The KR and KR1 relays remove normal grounds to which various relays of the test circuit have operated and locked.

The MFCl relay is operated by the KR relay to release the master test frame connector by opening the start battery lead. On trunk test calls, the TKT relay is locked to ground on the N relay in addition to the operate ground from a back contact of the KR relay. If the trunk test circuit is off-normal, the TKT relay and the class-of-test relay in series with it are held operated until the trunk test circuit restores to normal and closes the battery furnished on the B lead to the N lead to operate the N relay. This allows the TKT, TKT1, and TKT2 relays and the class-of-test relay in series with the TKT relay to release. The class-of-test relay releases. No new test call can be started until the TKT relay releases to reclose the start lead from the ST key.

While the RL may be operated at any time, it is possible that a false trouble record may be produced if it is operated at certain intervals while the marker is still connected.

SECTION M, PART 4

INCOMING TRUNK NO PULSING
CLASS OF TRUNK TEST - ITNP

Index

	<u>PAGE</u>
M4	M4-2
ITNP CLASS OF TRUNK TEST - GENERAL	
M4-1	M4-2
TEST FRAME SET UP WITH CLASS OF TEST CHART	
M4-2	M4-2
SEQUENCE CHART - ITNP CLASS OF TEST	
M4-3	M4-3
ITNP CLASS OF TEST - DESCRIPTION	
M4-3.1	M4-3
ITNP CLASS OF TEST - PREPARATION	
M4-3.2	M4-4
START OF ITNP TRUNK TEST	
M4-3.3	M4-4
INCOMING TRUNK SEIZURE BY MTC	
M4-3.4	M4-5
SELECTION OF MARKER BY IR	
M4-3.5	M4-5
MARKER CONNECTION TO MTFC	
M4-3.6	M4-5
OPERATE CONNECTING AND TEST RELAYS	
M4-3.7	M4-6
INPUT OF INFORMATION TO MARKER	
M4-3.8	M4-6
MARKER FUNCTIONS IN ESTABLISHING CONNECTION BETWEEN INCOMING TRUNK AND TERMINATING TEST LINE	
M4-3.9	M4-6
MARKER RELEASE	
M4-4	M4-7
DESCRIPTION OF ITNP TRUNK TEST CIRCUIT OPERATION	
M4-4.1	M4-7
RINGING DETECTION WITH TERMINATING TEST LINE	
M4-4.2	M4-7
TRIP AND PRETRIP TEST	
M4-4.3	M4-8
TERMINATING SUPERVISION AND CONTINUITY	
M4-4.4	M4-8
TEST OF AUTOMATIC DISCONNECT TEST	
M4-5	M4-8
TEST FRAME RELEASE	

The ITNP class of trunk test is used for testing incoming trunks. A patch cord connection is made from the trunk test circuit to the trunk under test. The marker is then directed to set a connection from the incoming trunk to the terminating test line. The trunk test circuit thus has control of both ends of the connection.

M4-1 TEST FRAME SET UP WITH CLASS-OF-TEST CHART

The class-of-test table summarizes in tabular form the key(s) and switch(es) used to establish an ITNP class of trunk test on the chart. A single line across all columns is used to separate a particular function with its associated figure, option, key, or switch. The double line within the single lines is used to separate the various options on vintages of master test control frames. The note column and sheet notes are as follows:

- (a) Note 1 indicates that all key(s) or switch(es) must be operated to make a proper test frame set up for this particular class of test.
- (b) Note 2 indicates the key(s) or switch(es) to be used to simulate the trouble record. Refer to simulation tables in SFD-D902, D904, or D906 and their associated colored trouble record card on the opposite pages (D903, D905, or D907) or the simulated table selected. The tables and colored trouble record cards, along with the class-of-test tables, will assist the maintenance personnel in selecting the proper key(s) or switch(es) to be operated in order to properly simulate the reported trouble condition.
- (c) Note 3 indicates those key(s) or switch(es) used for additional marker tests, but they are not required for the trouble record test or a simulation test.

M4-2 SEQUENCE CHART - ITNP CLASS (M404)

The sequence chart for the ITNP class of trunk test is a combination of a sequence chart and a flowchart. It is designed to show the main functional interactions between the Master Test Control (MTC) circuit, the Trunk Test (TT) circuit, the Master Test Frame Connector (MTFC) circuit and the Completing Marker (CM). Each double line box represents a particular circuit. The section and part of the SFD which provides full detail for the function is indicated within the box.

The overall progress of an ITNP trunk test call is depicted by the flow from one functional box to the next. With each box are skeletonized sequence chart depiction of the major progress points and information flow. In addition the keys and switches which are set up for the class of call are shown. The primary use of this chart is to show this overall progress of the call with key points of detail. It can be used to isolate a general trouble area if the test call fails in the set up stages.

M4-3 INCOMING TRUNK NO PULSING (ITNP) CLASS OF TEST - DESCRIPTION

The Incoming Trunk No-Pulsing (ITNP) class of test is used for testing incoming trunks in the No. 5 crossbar office. Before starting the test, the trunk test circuit is patched to the incoming trunk to be tested via the miscellaneous circuit. The MTC circuit connects to the trunk test circuit and signals it to prepare for an ITNP class of test.

The trunk test circuit closes a loop on the tip and ring leads to the incoming trunk and grounds its D lead. The trunk connects to an incoming register as on a service call, but also extends the grounded D lead to the register which causes it to recognize that it is handling a test call. The register connects to a marker without waiting for a number to be pulsed and operates the TST relay in the marker as a test signal. The marker, upon receiving the test signal, connects through the marker test control circuit which supplies the number of the line that the trunk is to be connected to. The marker proceeds to set up a connection from the incoming trunk to the line location it received from the master test control circuit. That line location is usually the terminating test line of the trunk test circuit, but it may be other test lines.

M4-3.1 ITNP - CLASS OF TEST - PREPARATION

In preparation for this class of test, a patch cord is connected between the (T) jack of the incoming trunk circuit and the (ITT) jack of the miscellaneous circuit which is multiplied to all frames equipped with incoming trunk circuits. Before placing the patch cord, the test employee should make that particular trunk busy at the originating end so as not to interfere with service calls which might be directed to that trunk at the originating end.

At this time it becomes necessary to operate the required loop signaling keys LLP, SLP, or SXS of the trunk test circuit which closes the required loop to the A relay of the incoming trunk circuit. Also the proper sleeve key HS or LS must be operated at this time along with the TLK key and the TTL key for connecting to the TTC terminating test line. If connection is to some other test line, the number of that line should be set on the A- to H- keys instead of operating the TTL key.

M4-3.2 START OF ITNP TEST

Operating the ST key of the MTC circuit operates the ST relay which closes ground to operate the corresponding trunk test class relay ITNP. It also operates the corresponding trunk test lamp or the STT lamp on later frames.

The ITNP relay operating opens the operate path of MC2 relay to prevent grounding certain leads to the marker which will be grounded by the incoming register, and it opens the MTP lead from the master test control to the master test connector to prevent the test circuit from selecting a marker.

Releasing the ST key removes shunting ground from the winding of the TKT relay (SFD-J104) allowing it to operate in series with the previously operated ITNP relay to ground furnished by the KR relay. The TKT relay operates the TKT1 which operates the TKT2 relay. The TKT1 relay furnishes ground through the operated ITNP relay to operate the ITNP relay in the trunk test circuit. The operated TKT1 relay furnishes resistance battery to operate N relay of the master test control. The N relay operates the N1 relay which locks to ground on the KR relay normal and grounds the STG lead to the trunk test circuit, to operate the ST relay of the trunk test circuit.

M4-3.3 INCOMING TRUNK SEIZURE BY MTC

When the master test control circuit starts the test it operates the ITNP and ST relays in the trunk test circuit. The ITNP relay connects the originating supervision circuit to a simulated outgoing trunk circuit consisting of relays S and CS. The outgoing loop from this simulated trunk circuit is closed by contacts of S relay through make contacts on one of the operated keys SXS, SLP, or LLP to the tip and ring of the ITT jack. Since the latter is patched to the test jack of the incoming trunk circuit, a loop is closed to the A relay in the trunk circuit under test, causing trunk to be seized when the trunk is seized by operation of its A relay over the loop closed by the S relay of the trunk test circuit. It bids for an incoming register as on a service call. When the register is connected it operates the trunk CO relay which cuts the sleeve lead of the jack through to the D lead to the IR. If the HS key is operated the HS relay operates and then operates the SLV lamp. The CS relay will operate from the trunk circuit battery and ground, but only momentarily until the register is connected to provide an on-hook condition after a brief interval of off-hook supervision. The CS relay operates the CS-OGT lamp.

Immediately after the SLV lamp lights, the LS key should be operated to provide a low resistance sleeve ground to the trunk and to the register. It is also possible to have operated the LS key initially. The ground on the sleeve operates the TCl relay in the IR informing it that it is handling a test call. The register then bids for a marker without waiting for a number to be pulsed.

M4-3.4 SELECTION OF MARKER BY IR

The ground on the D lead causes the register to immediately bid for a marker through the Incoming Register Marker Connector. When the marker is connected, its TST relay is operated. The TST relay puts the marker on long time out and causes the marker to connect to the master test control circuit via the master test frame connector in order to obtain the number of the line to which the test call is directed. When access has been gained, the MTFC operates the test relay in the marker putting it back on short time out and grounds the TS lead to the master test control.

M4-3.5 MARKER CONNECTION TO MTFC

On the ITNP class of test, the test circuit opens the MTP lead at the ITNP relay and does not select a marker. Instead, a marker connects to the test circuit in the following manner. The marker furnishes resistance battery through the operated TST relay over the TRST lead to the master test frame connector. This battery operates the corresponding MPR-relay and allows ground to be returned to the marker over the CI lead. The grounded CI lead, through the operated TST relay, operates the corresponding MKT-relay for that marker. The MKT-relay locks through normal contacts of the preceding MKT relays to ground on the MTL lead from the master test control. The connector grounds the TS lead to the MTC circuit.

M4-3.6 OPERATE CONNECTING AND TEST RELAYS

The grounded TS lead from the MTFC operates the Test Start (TS) relay which in turn operates the TS(1-10) relays. At the same time, the TS relay in the MTFC operates the MT test relay in the selected marker. The MT in turn operates other MT-relays in the marker. Some of them will depend on the keys and switches which are operated for the test.

In addition various connecting relays which generally control input information into the marker will operate or will have operated by this time depending on the keys operated. A check path through contacts of these tests and connecting relays provides a ground to operate the MC relay of the MTC when all appropriate relays are operated. The MC in turn operates the MC1-8 relays. These relays cut through many of the leads to the MTC and also control additional connecting relays.

On the ITNP class of test, the following test relays are always operated: MT, MT1, MT11, MT13, MT15, MT17, MT18, MT27, MT29, MT56.

On the ITNP class of test the following key connecting relays operate with the KY key operated: The K, K1, and the KA-KM relays depending upon amount of digits needed. If the TTL key is operated the K2 relay also operates.

M4-3.7 INPUT OF INFORMATION TO MARKER

With the test and connecting relays operated, the marker now has access to all information necessary to set the connection to the terminating test line. On a normal service call all information would have come from the incoming register. On the test call, the incoming register FR, CN, RG position, the TL number of the trunk being tested and the INC trunk class number is still received from the IR, but the digits (A,E) and ringing combination are obtained from the master test control.

The called number information received on an ITNP class with the TTL key operated, are the TH-, HN-, T-, U- digits from the TT2 relay cross-connections, which follow the office code digits whether the office code consists of none, one, two, or three digits. This is accomplished by the operation of the KA, KB, KC relays which are operated through the A,B,C digits of an office code. If there is no office code, the NA, NA1 relays operate through normal contacts of KA, KB, KC. With one digit, the NB and NB1 relay operated, two digits the NC and NC1 relays operate, three digit office code, the ND, and ND1 relays operate.

M4-3.8 MARKER FUNCTION TO ESTABLISH CONNECTION BETWEEN INCOMING TRUNK AND TERMINATING TEST LINE

After the CM has received the indication of an ITNP class of test and the digits of the terminating test line, it functions like it would on a TER class of call in establishing connection between the incoming trunk being tested and the TTL of the trunk test circuit. The marker must seize the trunk link frame on which the incoming trunk terminates. The TL frame number is received from the IR. A number group is selected to translate the digits received from the MTC to enable the marker to seize the line link in which the terminating test line is located. The channel test leads are closed through to select an idle channel between the incoming trunk being tested and the TTL. The established channel is checked, the number group is released and the ringing switch is operated. The LK1 relay operates if all tests are satisfactory and the marker proceeds to disconnect and restore to normal.

M4-3.9 MARKER RELEASE

When the marker has completed setting up the connection it grounds the DCT lead operating the DCT relay of the MTC which, with the REC key normal, operates the M01 relay to extend the DCT lead back to the marker to cause it to advance.

When the marker grounds the LK2 lead, the LK2 and DIS1 relay of the MTC are operated lighting the LK2 and DIS1 lamps. The marker grounds the MRL lead as a regular release signal, operating the MRL relay which lights the MRL lamp and operate the MFC relay. The MFC relay operates the MFCL and these relays function to release the MTFC and part of the MTC. The RCY lead to the trunk test circuit is also grounded as a signal that the connection has been set.

M4-4 DESCRIPTION OF TRUNK TEST CIRCUIT OPERATION - ITNP TEST

In the ITNP class of trunk test the trunk test circuit consists of a simulated outgoing trunk circuit containing the S and CS relays. A loop consisting of the PK relay, operated contacts of ST, ITNP and resistors E and F back through the operated TLK key to the master test frame telephone circuit hold the S relay operated simulating an originating call. Relay S and ST operated hold the A relay operated in the incoming trunk under test.

The terminating side of the incoming trunk circuit is connected to the terminating test line. This part of the trunk test circuit provides provisions for pretrip or trip test and supervision. After ringing has been tripped, reverse battery supervision from the incoming trunk circuit actuates the CS relay which lights the OGT-CS lamp. After ringing is tripped, the ANS key is operated which operates ANS relay. This relay connects a loop consisting of resistors H and L, relay LK, and transformer ANS across the terminating loop. The LK relay operating checks the continuity of the loop by connecting high tone through the incoming trunk circuit to the test employee which checks the ability of the incoming trunk circuit to transmit speech.

M4-4.1 RINGING DETECTION WITH TERMINATING TEST LINE

The terminating portion of an ITNP trunk test must be able to distinguish what side (Tip/Ring) of a line the ringing appears, the code and, in offices with superimposed ringing, the polarity of D.C. potential. This feature is accomplished by the ringing detection circuits which enable the terminating portion of the call to identify the coded ringing by lighting one of four lamps. Lamp (R-) shows a negative D.C. potential on the ring side, lamp (T-) a negative potential on the tip side. The positive D.C. potential is shown by the lamps (R+) and (T+) representing the ring and tip sides of the line.

These four lamps are operated by correspondingly designated relays which operate through cathode tubes through a series of varistors, thermistors and resistors. Correct ringing is identified by one of the four tubes operating which in turn operate its corresponding relay. The lighted lamp verifies the type of ringing applied.

M4-4.2 TRIP AND PRETRIP TEST

In an ITNP trunk test on the terminating portion of the call, it is necessary to check the trunk for its ability to trip ringing only when the called subscriber answers. This test is accomplished through a series of resistors (P+Q) connected to the Tip/Ring through the contacts of an operated TRP or PTP key.

To apply a pretrip test it is necessary to wait for the silent interval (extinguished R+, R-, T+, T- lamps). Momentarily operate the PTP key during a silent interval and release. It should be observed that the trunk did not trip ringing and the particular ringing lamp lights again. During the next silent interval the TRP key is momentarily operated and released. It should be observed that ringing has been tripped and no ringing lamp occurs.

M4-4.3 TERMINATING SUPERVISION AND CONTINUITY

In the ITNP class of trunk test, the connection is set up to the terminating test line. After ringing is tripped, the ANS key is operated which operates relay ANS. This relay connects a loop, consisting of resistors H&L, relay LK and the ANS transformer across the terminating loop. The resistance in this loop gives an operate test to the called party supervisory relay of the trunk circuit. At the same time relay LK checks the continuity of the loop. When it operates it connects high tone back through the trunk circuit which checks the ability of the trunk circuit to transmit speech.

M4-4.4 TEST OF AUTOMATIC DISCONNECT FEATURES

The TLK key controls originating supervision and the ANS key controls terminating supervision in the ITNP class of trunk test. The automatic release feature of the trunk with either the originating or terminating end disconnecting first can be checked using the normal test procedure. The automatic release time should be 13 to 32 seconds for originating end supervision. It is assumed that the thermal relay RL which controls the automatic release in the trunk has not been used for 4 minutes or more before the test is made.

M4-5 TEST FRAME RELEASE

Operating the release key at any time operates the KR and KR1 relays which lock to make contacts on a number of relays in the test circuit to insure that the circuit restores to normal before another test can be started. The KR and KR1 relays remove normal grounds to which various relays of the test circuit have operated and locked.

The MFCl relay is operated by the KR relay to release the master test frame connector by opening the start battery lead. On trunk test calls, the TKT relay is locked to ground on the N relay in addition to the operate ground from a back contact of the KR relay. If the trunk test circuit is off-normal, the TKT relay and the class-of-test relay in series with it are held operated until the trunk test circuit restores to normal and closes the battery furnished on the B lead to the N lead to operate the N relay. This allows the TKT, TKT1, and TKT2 relays and the class-of-test relay in series with the TKT relay to release. The class-of-test relay releases. No new test call can be started until the TKT relay releases to reclose the start lead from the ST key.

While the RL may be operated at any time, it is possible that a false trouble record may be produced if it is operated at certain intervals while the marker is still connected.

SECTION M, PART 5
INTERMARKER GROUP TRUNK TEST
(IAO CLASS OF TEST)

Index

		<u>PAGE</u>
M5	INTERMARKER GROUP TRUNK TEST, GENERAL	M5-2
M5-1	TEST FRAME SET UP WITH CLASS OF TEST TABLE	M5-2
M5-2	SEQUENCE CHART - IMG TRUNK TEST	M5-2
M5-3	IMG TRUNK TEST DESCRIPTION	M5-3
M5-3.1	IMG TEST PREPARATION	M5-3
M5-3.2	START OF IMG CLASS OF TRUNK TEST	M5-3
M5-3.3	SELECTION OF MARKER	M5-4
M5-3.4	OPERATION OF CONNECTING AND TEST RELAYS	M5-4
M5-3.5	INPUT INFORMATION TO MARKER	M5-5
M5-3.6	SELECTION OF PARTICULAR TRUNK	M5-5
M5-3.6.1	NTFS Key Operated	M5-5
M5-3.6.2	NTTS Key Operated	M5-5
M5-3.7	MARKER RELEASE	M5-6
M5-4	DESCRIPTION OF IMG TRUNK TEST CIRCUIT OPERATION (IAO CLASS OF TEST)	M5-7
M5-4.1	RINGING DETECTION WITH TERMINATING TEST LINE	M5-7
M5-4.2	TRIP AND PRETRIP TEST	M5-8
M5-4.3	TERMINATING SUPERVISION AND CONTINUITY	M5-8
M5-4.4	ANSWER AND DISCONNECT TESTING	M5-8
M5-4.5	AUTOMATIC DISCONNECT FEATURE	M5-9
M5-5	TEST FRAME RELEASE	M5-9

M5 INTERMARKER GROUP TRUNK TEST - GENERAL

An IMG SUB-SUB trunk is tested in the IAO class of test. In this class of test the originating end of the IMG trunk is connected to the originating test line and the terminating side of the trunk under test is connected to the terminating test line in the called marker group. The IMGA/IMGB key would be operated depending upon which marker group the terminating side of the intermarker group trunk appears. These keys transfer the terminating side of the trunk test circuit to the terminating side of the trunk test circuit to the terminating test line in the called marker group. The trunk test circuit thus has control of both ends of the connection.

M5-1 TEST FRAME SET UP WITH CLASS-OF-TEST CHART

The class-of-test table summarizes in tabular form the key(s) and switch(es) used to establish an IAO class of trunk test on the chart. A single line across all columns is used to separate a particular function with its associated figure, option, key, or switch. The double line within the single lines is used to separate the various options on vintages of master test control frames. The note column and sheet notes are as follows:

- (a) Note 1 indicates that all key(s) or switch(es) must be operated to make a proper test frame set up for this particular class of test.
- (b) Note 2 indicates the key(s) or switch(es) to be used to simulate the trouble record. Refer to simulation tables in SFD-F702, F704, or F706 and their associated colored trouble record card on the opposite pages (F703, F705, or F707) or the simulated table selected. The tables and colored trouble record cards, along with the class of test tables, will assist the maintenance personnel in selecting the proper key(s) or switch(es) to be operated in order to properly simulate the reported trouble condition.
- (c) Note 3 indicates those key(s) or switch(es) used for additional marker tests, but they are not required for the trouble record test or a simulation test.

M5-2 SEQUENCE CHART - IMG TRUNK TEST

The sequence chart for the IMG trunk test is a combination of a sequence chart and a flowchart. It is designed to show the main functional interactions between the Master Test Control (MTC) circuit, the Trunk

Test (TT) circuit, the Master Test Frame Connector (MTFC) circuit and the Completing Marker (CM). Each double line box represents a particular circuit. The section and part of the SFD which provides full detail for the function is indicated within the box.

The overall progress of an IMG trunk test call is depicted by the flow from one functional box to the next. Within each box are skeletonized sequence chart depiction of the major progress points and information flow. In addition the keys and switches which are set up for the class of call are shown. The primary use of this chart is to show this overall progress of the call with key points of detail. It can be used to isolate a general trouble area if the test call fails in the set up stages.

M5-3 IMG TRUNK TEST DESCRIPTION

On an IMG trunk test using the IAO class of trunk test, the master test control circuit directs a marker to establish a connection from the originating test line to the calling or originating end of the IMG trunk to be tested and from the terminating test line of the called marker group to the terminating side of the trunk under test. When this connection is established, the trunk test circuit has control of both ends of the trunk under test and enables the various tests to be performed.

M5-3.1 IMG TEST PREPARATION

On an IMG trunk test using the IAO class of trunk test, the master test control circuit primes the marker with the office code of the called marker group, dialed digits, class of service, trunk link appearance of the trunk to be tested and other necessary information detailed on the test frame test chart shown on SFD-M502. In addition, a telephone set should be plugged into the jacks of the master test frame telephone circuit, the TLK key operated and the IMGA/IMGB operated depending upon which marker group the terminating side of the IMG trunk appears.

M5-3.2 START OF IMG TRUNK TEST

Operating the ST key operates the ST relay (MTC) which closes ground through the operates TSTB (IAO) switch to operate the corresponding IAO relay. The operated IAO relay furnishes ground for the operation of the OTL1 relay which gives the marker the originating test line location.

Releasing the ST key removes the shunting ground from the winding of the IAO relay (SFD-J104) allowing it to operate in series with the previously operated IAO relay to ground furnished by KR relay. The TKT relay operates the TKT1 which operates the TKT2 relay. Operation of these relays opens the lead from the ST key to prevent shunting down the relay on subsequent operation of the ST key.

The TKT1 relay extends ground to the trunk test circuit on the MC lead for later use to signal the trunk test circuit to close a connecting relay to the master test frame connector. The operated TKT1 relay furnishes resistance battery to operate N relay of the MTC. The N relay operates the N1 relay which locks to ground on the KR relay normal, grounds the STG lead to the trunk test circuit for operation of the ST relay of the trunk test circuit and closes start battery to the master test frame connector MTP lead.

M5-3.3 SELECTION OF A MARKER

On IAO class of trunk test, the test circuit selects a marker by closing start battery on the MTP lead to the master test frame connector and operates the test preference relay (MTP) in that circuit which returns ground on the MKS lead when preceding relays in the preference chain are normal. The MKS ground feeds through back contacts of normal marker selection keys MT- or switches MTU- to the corresponding MKT- lead to operate MKT- relay in the connector for the marker selected. The connector makes the marker busy and, after verifying that the marker is normal, operates test relays in the marker, closes connector relays to the marker, and operates TS relay in the master test frame connector. This in turn grounds the TS lead to the MTC circuit.

M5-3.4 OPERATE CONNECTING AND TEST RELAYS

The grounded TS lead from the MTFC operates the Test Start (TS) relay which in turn operates the TS1-10 relays. At the same time, the TS relay in the MTFC operates the MT test relay in the selected marker. The MT in turn operates other MT- relays in the marker. Some of them will depend on the keys and switches which are operated for the test. In addition various connecting relays which generally control input information into the marker will operate or will have operated by this time depending on the keys operated. A check path through contacts of these tests and connecting relays provides a ground to operate the MC relay of the MTC when all appropriate relays are operated. The MC in turn operates the MC1-8 relays. These relays cut through many of the leads to the MTC and also control additional connecting relays.

On an IAO class of test, the following test relays are always operated: MT, MT1, MT11, MT13, MT15, MT17, MT18, MT27, MT29, MT56.

Other test relays will operate depending on the test frame test setup. These relays are: MT4, MT14, MT24 associated with the FS key, MT7, MT8 associated with the CH key and the MT9 relay associated with the NTFS key.

On an IAO class of test the following key connecting relays operate: KTS, KOR, KFS with the FS key operated, KMT9 with an operated NTFS key and with the KY key the following relays will operate: K, K1, KA-KM. If the TTL key is operated the K2 will operate.

M5-3.5 INPUT INFORMATION TO MARKER

With the test and connecting relays operated the marker is given various input information that it would normally receive from an originating register as well as additional control information.

The operated OTL1 relay grounds the FT0-3 FU-0,1,2,4,7, VG-0,1,2,4,7,10, HG-0,1,2,4,7, and VF-0-4 leads to which it is cross-connected to give the marker the originating test line location. The operated OTL1 and KCS3 relay cut through class-of-service information.

The called number information is cut through in one of several ways depending on the keys and switches operated. With the KY key operated the called numbers set on the A-0-9 to L-0-9 keys are given to the marker.

If the TTL key is operated, the terminating test line numbers of the trunk test circuit is passed to the marker through the TTL1 relay which is cross connected to give the TH, HN, T, U information. The IMG code is set on the A(0-9), B(0-9), and C(0-9) keys or switches to provide the full called number to the marker.

M5-3.6 SELECTION OF A PARTICULAR TRUNK

In order to direct a marker to select a particular trunk, the marker must be primed with information to select the particular route relay associated with the IMG group of trunks. The A, B, C digits should be operated for the IMG code. The marker is directed by the FG(1,2) key and the FS(0-9) switch to select the trunk link on which the desired trunk appears. In the same manner the marker is directed to select a particular trunk within a 20 trunk block by operation of one of the TSU(0-9) switch and the TST1 key for TS-10-19 appearances.

M5-3.6.1 NTFS Key Operated

The NTFS key, the FG(1,2) key, and one FS(0-9) switch are operated to select a particular trunk link frame without first testing for idle trunks on the frame and without testing for manual frame make-busy condition. This method of particular trunk link frame selection is required in order to allow the marker to connect to a trunk link frame on which all trunks of the desired group are plugged busy. The marker must be connected to the trunk link frame before it can operate a relay on that frame which allows the marker to select a plugged-busy trunk.

With the NTFS key operated, operation of the TKS relay operates the KMT9 relay which locks to the TKS relay, and operates the KF5 relay which also locks to the TK5 relay. The KF5 and MKT9 relays ground the MT3 and MT9 leads to operate test relays in the marker when the MT relay has been operated by the master test frame connector. The NTFS key operated, opens the operate path of the MC relay of the test circuit and requires that the proper test relays of the marker are operated before the MC relay can operate to allow the test circuit to prime the marker. (Similar to SFD-C507.)

The above test relays operated in the marker prevent the marker from making normal trunk link selection and instead prepare it to select the trunk link frame as it would on an incoming call from grounds on the FG(0-2) leads and the TF(0,1,2,4,7) leads on a 2/5 basis. The MC4 relay operates the KTF relay which closes grounds on the FG(0-2) leads and the TF(0,1,2,4,7) leads from contacts of the operated FG(0-2) key and FS(0-9) switch causing the marker to connect to the corresponding trunk link frame. (Similar to SFD C306.)

M5-3.6.2 Selection of Particular Trunk Within 20 Block - NTTS Key Operated (Similar to SFD C309)

The NTTS key and TS0 switch are operated in order to restrict the marker to testing for that trunk of a 20 block corresponding to the operated TS0 switch and remove the busy condition from all trunks on the trunk link frame to which the marker connects in order to allow plugged-busy trunks to be selected.

Upon operation of the MC6 relay with the HMJA relay normal the NTTS key and the KTS relay operated. The TST lead is grounded. This lead is closed through the master test frame connector to the trunk link frame to which the marker is connected and operates the TST relay in the trunk link frame. This relay removes the manual make busy condition from all trunks on that trunk link frame. With the NTTS key operated, when the TST relay of the trunk link frame operates, it in turn operates the TSK relay to light the TSK lamp as an indication of satisfactory operation of the TST relay.

Wire spring markers use double wound relays, each of which operate from either an even or from the next higher numbered odd TS(0-19) switch position and, therefore, would permit the marker to select either of two trunks. To prevent this, test relay MTG in the marker opens the leads which permit the marker to prefer odd or even trunks and extends both ends of these leads to the master test control circuit as Even Trunk Selection (ETS0 and ETS1) and Odd Trunk Selection (OTS0 and OTS1). All even numbered TSU switch position connect ETS0 and ETS1 to permit selection of even trunks and all odd ones connect OTS0 to OTS1 to permit selection of odd trunks.

M5-3.7 MARKER RELEASE

A marker test relay operated in the marker on IMG test calls splits the DCT lead from the front contacts of the marker DCT relay. Both ends of the lead (DCT and TDCT) are brought into the test circuit through the contacts of the operated M01 relay. When the DCT of the CM operates, it operates the DCT relay of the test circuit which is a signal to the test circuit that the marker has completed all of its functions and is about to start the release of connecting circuits. The operation of the DCT relay of the test circuit operates the M01 relay. When the M01 relay

operates, it extends the DCT lead from the marker through contacts of the DCT relay operated to the TDCT lead to the marker. This action permits the CM to continue its normal release functions.

The marker grounds the MRL lead as a regular release signal, operating the MRL relay which lights the MRL lamp and operates the MFC relay. The MFC relay operates the MFC1 and these relays function to release the MTFC and part of the MTC.

M5-4 DESCRIPTION OF IMG TRUNK TEST CIRCUIT OPERATION (IAO CLASS OF TEST)

The MTC circuit has initiated the action necessary to prime the CM to establish a network connection. This network consists of the IMG trunk test (IAO class of test) on the MTF, the MTC, the originating test line, the calling marker group trunk link appearance of the IMG trunk to be tested, the called marker group trunk link appearance of the IMG trunk, and the terminating test line of the called marker group determined by the operation of the IMGA or IMGB key. These keys transfer the terminating side of the trunk test circuit to the terminating test line in the called marker group.

With the TLK key operated, a circuit is closed across the originating test line tip and ring. Included in this circuit are the PK relay, the E and F resistors, the operated ST relay contacts and the coil in the telephone circuit. If polarity differs from normal, battery on the ring, relay PK will operate. If the loop is open or if the trunk circuit originating supervisory relay fails to operate, the trunk circuit will not hold. Evidence of failure to hold is generally the extinguishing of the AS lamp. With this network connection established, the tests that can be applied to the IMG trunk are basically those tests that can be applied to IAO trunks.

M5-4.1 RINGING DETECTION WITH TERMINATING TEST LINE

The terminating portion of an IMG trunk test must be able to distinguish what side (TIP/RING) of a line the ringing appears, the code and, in offices with superimposed ringing, the polarity of D.C. potential. This feature is accomplished by the ringing detection circuits which enable the terminating position of the call to identify the coded ringing by lighting one of four lamps. Lamp (R-) shows a negative D.C. potential on the ring side, lamp (T-) a negative potential on the tip side. The positive D.C. potential is shown by the lamps (R+) and (T+) representing the ring and tip sides of the line.

These four lamps are operated by corresponding designated relays which operate through cathode tubes. Through a series of varistors, thermistors and resistors, correct ringing is identified by one of the four tubes operating which in turn operates its corresponding relay. The lighted lamp verifies the type of ringing applied.

M5-4.2 TRIP AND PRETRIP TEST

In an IMG trunk test on the terminating portion of the call, it is necessary to check the trunk for its ability to trip ringing only when the called subscriber answers. This test is accomplished through a series of resistors (P & Q) connected to the TIP/RING through the contacts of an operated TRP or PTP key.

To apply a pretrip test it is necessary to wait for the silent interval (extinguished R+, R-, T+, T- lamps). Momentarily operate the PTP key during a silent interval and release. It should be observed that the trunk did not trip ringing and the particular ringing lamp lights again. During the next silent interval the TRP key is momentarily operated and released. It should be observed that the ringing has been tripped and no ringing lamp occurs.

M5-4.3 TERMINATING SUPERVISION AND CONTINUITY

On an IMG trunk test (IAO class of test), the connection is set up to the terminating test line in the called marker group. After ringing is tripped, the ANS key is operated which operates relay ANS. This relay connects a loop, consisting of resistors H and L, relay LK and the ANS transformer across the terminating loop. The resistance in this loop gives an operate test to the called party supervisory relay of the trunk circuit. At the same time relay LK checks the continuity of the loop. When it operates, it connects high tone back through the trunk circuit which checks the ability of the trunk circuit to transmit speech.

M5-4.4 ANSWER AND DISCONNECT TESTING

A. Answer Testing

When simulating a called customer answer on an IMG trunk test the ANS key is operated. The operation of the ANS key operates the ANS relay which lights the ANS lamp to verify the operation. The ANS relay closed a loop through the LK relay to the terminating test line. A check of transmission pair continuity is made when the LK relay operates to apply tone via the ANS relay. The tone indicates the ability of the trunk to transmit.

B. Disconnect Testing

When simulating calling customer disconnect the TRK test circuit will initiate this action by releasing the ANS relay. The release of the ANS relay opens the loop at the terminating test line releasing the LK and the CS relay in the trunk under test. When the trunk releases, ground is removed from the sleeve leads releasing the AS and TS relays. This action operates the TC relay as an indication that the test is complete.

M5-4.5 TEST OF AUTOMATIC DISCONNECT FEATURES WITH TRUNK TEST CIRCUIT

Since the TLK key controls originating supervision and the ANS key controls terminating supervision in the IMG trunk test (IAO class of test) the automatic release feature with either the originating or terminating end disconnecting first can be checked by these keys. The automatic release of the terminating end (ANS key) should be 13 to 32 seconds. It is assumed that the thermal delay relay which controls the automatic release in the trunk has not been used for 4 minutes or more before the time test is made.

M5-5 TEST FRAME RELEASE

Operating the release key at any time operates the KR and KR1 relays which lock to make contacts on a number of relays in the test circuit to insure that the circuit restores to normal before another test can be started. The KR and KR1 relays remove normal grounds to which various relays of the test circuit have operated and locked.

The MFC1 relay is operated by the KR relay to release the master test frame connector by opening the start battery lead. On trunk test calls, the TKT relay is locked to ground on the N relay in addition to the operate ground from a back contact of the KR relay. If the trunk test circuit is off-normal, the TKT relay and the class-of-test relay in series with it are held operated until the trunk test circuit restores to normal and closes the battery furnished on the B lead to the N lead to operate the N relay. This allows the TKT, TKT1, and TKT2 relays and the class-of-test relay in series with the TKT relay to release. The class-of-test relay releases. No new test call can be started until the TKT relay releases to reclose the start lead from the ST key.

While the RL may be operated at any time, it is possible that a false trouble record may be produced if it is operated at certain intervals while the marker is still connected.

SECTION M, PART 6

OUTGOING (TANDEM) CLASS OF TRUNK TEST

Index

		<u>PAGE</u>
M6	OUTGOING (TANDEM) CLASS OF TRUNK TEST	M6-2
M6-1	TEST FRAME SET UP WITH CLASS OF TEST TABLE	M6-2
M6-2	SEQUENCE CHART, OUTGOING (TANDEM) CLASS OF TRUNK TEST	M6-3
M6-3	OUTGOING TRUNK (TANDEM) TEST DESCRIPTION	M6-3
M6-3.1	OGT (TANDEM) TEST PREPARATION	M6-3
M6-3.2	START OF OGT (TANDEM) CLASS OF TRUNK TEST	M6-3
M6-3.3	SELECTION OF A MARKER	M6-4
M6-3.4	OPERATE CONNECTING AND TEST RELAYS	M6-4
M6-3.5	INPUT INFORMATION TO MARKER	M6-5
M6-3.6	SELECTION OF A PARTICULAR TRUNK	M6-5
M6-3.6.1	NTFS Key Operated	M6-6
M6-3.6.2	NTTS Key Operated	M6-6
M6-3.7	MARKER RELEASE	M6-7
M6-4	DESCRIPTION OF TRUNK TEST CIRCUIT OPERATION - OGT (TANDEM) CLASS OF TRUNK TEST	M6-7
M6-5	TEST FRAME RELEASE	M6-8

M6 OUTGOING (TANDEM) CLASS OF TRUNK TEST

The OGT-TAN class of test is used for testing tandem outgoing trunks included in routes to which the marker is directed by translation of office code using its LT translator. The Master Test Control (MTC) circuit connects to the Trunk Test (TT) circuit and signals it to prepare for a test of an outgoing tandem trunk, the test circuit simulates an incoming tandem trunk, incoming register and proceeds to connect to a marker which it directs to set up a connection from the originating test line, to the tandem outgoing trunk to be tested. The marker is signaled to operate the TTM relay in the trunk link and the TT relay in the trunk which gives the trunk test circuit access to the outgoing end of the trunk. The marker extends an No Digits (ND) signal to the outgoing sender to allow it release without pulsing. After the TT relay in the outgoing trunk circuit has operated, the TT relay connects the outgoing tip and ring, TO and RO leads, of the trunk into the TLF trunk test multiple which is extended to the trunk test circuit. The outgoing end of the trunk under test is now connected to the trunk test circuit which simulates an incoming trunk. In addition, the trunk test circuit has access to the originating end of the connection at the originating test line. Thus, both ends of the trunk are under control of the trunk test circuit.

M6-1 TEST FRAME SET UP WITH CLASS-OF-TEST CHART

The class-of-test table summarizes in tabular form the key(s) and switch(es) used to establish an OGT class of trunk test on the chart. A single line across all columns is used to separate a particular function with its associated figure, option, key, or switch. The double line within the single lines is used to separate the various options on vintages of master test control frames. The note column and sheet notes are as follows:

- (a) Note 1 indicates that all key(s) or switch(es) must be operated to make a proper test frame set up for this particular class of test.
- (b) Note 2 indicates the key(s) or switch(es) to be used to simulate the trouble record. Refer to simulation tables in SFD-G902, G904, or G906 and their associated colored trouble record card on the opposite pages (G903, G905, or G907) or the simulated table selected. The tables and colored trouble record cards, along with the class-of-test tables, will assist the maintenance personnel in selecting the proper key(s) or switch(es) to be operated in order to properly simulate the reported trouble condition.
- (c) Note 3 indicates those key(s) or switch(es) used for additional marker tests, but they are not required for the trouble record test or a simulation test.

M6-2 SEQUENCE CHART - OGT (TAN) CLASS OF TEST

The sequence chart for the outgoing class of trunk test is a combination of a sequence chart and a flow chart. It is designed to show the main functional interactions between the MTC circuit, the TT circuit, the Master Test Frame Connector (MTFC) circuit and the Completing Marker (CM). Each double line box represents a particular circuit. The section and part of the SFD which provides full detail for the function is indicated within the box.

The overall progress of an outgoing trunk test call is depicted by the flow from one functional box to the next. Within each box are skeletonized sequence chart depiction of the major progress points and information flow. In addition the keys and switches which are set up for the class of call are shown. The primary use of this chart is to show this overall progress of the call with key points of detail. It can be used to isolate a general trouble area if the test call fails in the set up stages.

M6-3 OUTGOING TRUNK (TANDEM) TEST DESCRIPTION

On an OGT TAN class of trunk test the MTC directs a marker to set a connection from the originating test line to the trunk circuit under test. The trunk TT relay is operated transferring the outgoing TIP and RING leads back to the trunk test circuit via the trunk test multiple of the trunk link frames. When the connection is established the trunk test circuit has control of both ends of the trunk circuit.

M6-3.1 OGT (TANDEM) TEST PREPARATION

On an OGT (TANDEM) class of trunk test the MTC simulates an INC TAN trunk, incoming register and primes the marker with the code, digits, translation, class of service, and selected trunk information. Keys and switches must be set to provide this information as detailed on the test set up chart on SFD-M602. In addition, a telephone set should be plugged into the jacks of the master test frame telephone circuit and the TLK key should be operated.

M6-3.2 START OF OGT (TANDEM) CLASS OF TRUNK TEST

Operating the ST key operates the ST relay (MTC) which closes ground through the operated TSTB (OGT) switch to operate the corresponding OGT relay. The TAN relay in the MTC operates through the incoming class switch (TAN) to operate the corresponding TAN relay in the trunk test circuit. The operated OGT relay furnishes ground for the operation of the OTL1 relay which gives the marker the originating test line location. It also furnishes ground on the OTT lead, to signal the marker to operate the TT relay in the outgoing trunk, and on the NDI lead, to signal the marker to give the sender an ND signal.

Releasing the ST key removes the shunting ground from the winding of the TRK relay (SFD-J104) allowing it to operate in series with the previously operated OGT relay to ground furnished by KR relay. The TKT relay operates the TKT1 which operates the TKT2 relay. The operation of the TKT relay opens the lead from the ST key to prevent shunting down the relay on subsequent operation of the ST key.

The TKT1 relay extends ground to the trunk test circuit on the MC lead for later use to signal the trunk test circuit to close a connecting relay to the master test frame connector. The TKT1 relay furnishes ground through the operated OGT relay to operate the OGT relay in the trunk test circuit and operates the TKT3 which in turn operates the TAN relay in the trunk test circuit. The operated TKT1 relay furnishes resistance battery to operate N relay of the MTC. The N relay operates the N1 relay which locks to ground on the KR relay normal, grounds the STG lead to the trunk test circuit for operation of the ST relay if the trunk test circuit and closes start battery to the master test frame connector MTP lead.

M6-3.3 SELECTION OF A MARKER - SFD-J108

On OGT (TAN) class of trunk test, the test circuit selects a marker by closing start battery on the MTP lead to the MTFC and operates the test preference relay (MTP) in that circuit which returns ground on the MKS lead when preceding relays in the preference chain are normal. The MKS ground feeds through back contacts of normal marker selection keys MT- or switches MTU- to the corresponding MKT- lead to operate MKT- relay in the connector for the marker selected. The connector makes the marker busy and, after verifying that the marker is normal, operates test relays in the marker, closes connector relays to the marker, and operates TS relay in the master test frame connector. This in turn grounds the TS lead to the MTC circuit.

M6-3.4 OPERATE CONNECTING AND TEST RELAYS

The grounded TS lead from the MTFC operates the TS relay which in turn operates the TS(1-10) relays. At the same time, the TS relay in the MTFC operates the MT test relay in the selected marker. The MT in turn operates other MT- relays in the marker. Some of them will depend on the keys and switches which are operated for the test. In addition various connecting relays which generally control input information into the marker will operate or will have operated by this time depending on the keys operated. A check path through contacts of these tests and connecting relays provides a ground to operate the MC relay of the MTC when all appropriate relays are operated. The MC in turn operates the MC1-8 relays. These relays cut through many of the leads to the MTC and also control additional connecting relays.

On an OGT TAN class of test the following relays in the marker are always operated, MT, MT1, MT13, MT15, MT17, MT18, MT27, MT29, and MT56. Other test relays will operate if the associated keys are operated: MT4, MT14, MT24, with the FS key, MT9 with the NTFS key and MT5 and MT6 with TS key. The key connecting relays which operate on the OGT (TAN) test are the KTS, KOR, KCS3, KCS6, KOS, if the OSS key is operated the KOSA and KOSG relays operate, KFS relay with FS key or KMT9 with NTFS key. K, K1, KA to KM relays with KY key or K2 with the TTL key.

M6-3.5 INPUT INFORMATION TO MARKER

With the test and connecting relays operated the markers given various input information that it would normally receive from the OR as well as additional control information.

The operated OTL1 relay grounds the FT0-3 FU0,1,2,4,7, VG0,1,2,4,7,10, HG0,1,2,4,7 and VF0-4 leads to which it is cross-connected to give the marker the originating test line location.

The operated OTL1 and KCS3 relay cut through class-of-service information.

The called number information is cut through in one of several ways depending on the keys and switches operated. With the KY key operated the called numbers set on the A0-9 to L0-9 keys is given to the marker.

If the TTL key is operated, the incoming trunk terminating test line number common to all offices in the area is passed to the marker. The office code set on the A0-9, B0-9, and C0-9 provides the full called number to the marker. If the office code consists of only 1 or 2 digits they are set respectively on the A0-9 or A0-9 and B0-9 switches. If no office code is used the A(0-9), B(0-9), and C(0-9) switches are left normal.

When the TTL2 relay operates, the thousands, hundreds, tens, and units digits cross-connected for the incoming trunk terminating test line number are shifted to immediately follow the office code digits whether the office code consists of none, one, two or three digits. If there is no office code, the NA, NAl relays operate through normal contacts of the of the KA, KB, KC relays. With a one digit code the NB and NB1 relays operate, two digits, the NC and NC1 relays operate and with a three digit code, the ND and ND1 relays operate. The set of relays that operate is determined by the KA, KB, KC relays. The KA, KB, KC relays operate in accordance with the A, B, C, digits or office code.

M6-3.6 SELECTION OF A PARTICULAR TRUNK

In order to direct a marker to select a particular trunk, the marker must be primed with information which will translate to operate a route relay which includes the desired trunk as part of its route. The called number keys A(0-9) through K(0-9) should be operated for a code whose

route includes the desired trunk. The marker is directed by the FG(1,2) key and the FS(0-9) switch to select the trunk link on which the trunk appears. In the same manner the marker is directed to select a particular trunk within a 20 block by operation of one of the TSU(0-9) switch and the TST1 key for TS(10-19) appearances.

M6-3.6.1 NTFS Key Operated

The NTFS key, the FG(1,2) key, and one FS(0-9) switch are operated to select a particular trunk link frame without first testing for idle trunks on the frame and without testing for manual frame make-busy condition. This method of particular trunk link frame selection is required in order to allow the marker to connect to a trunk link frame on which all trunks of the desired group are plugged busy. The marker must be connected to the trunk link frame before it can operate a relay on that frame which allows the marker to select a plugged-busy trunk.

With the NTFS key operated, operation of the TKS relay operates the KMT9 relay which locks to the TKS relay, and operates the KF5 relay which also locks to the TK5 relay. The KF5 and MKT9 relays ground the MT3 and MT9 leads to operate test relays in the marker when the MT relay has been operated by the master test frame connector. The NTFS key operated, opens the operate path of the MC relay of the test circuit and requires that the proper test relays of the marker are operated before the MC relay can operate to allow the test circuit to prime the marker. (Similar to SFD-C507.)

The above test relays operated in the marker prevent the marker from making normal trunk link selection and instead prepare it to select the trunk link frame as it would on an incoming call from grounds on the FG(0-2) leads and the TF(0,1,2,4,7) leads on a 2/5 basis. The MC4 relay operates the KTF relay which closes grounds on the FG(0-2) leads and the TF(0,1,2,4,7) leads from contacts of the operated FG(0-2) key and FS(0-9) switch causing the marker to connect to the corresponding trunk link frame. (Similar to SFD C306.)

M6-3.6.2 Selection of Particular Trunk Within 20 Block - NTTS Key Operated

The NTTS key and TS0 switch are operated in order to restrict the marker to testing for that trunk of a 20 block corresponding to the operated TS0 switch and remove the busy condition from all trunks on the trunk link frame to which the marker connects in order to allow plugged-busy trunks to be selected.

Upon operation of the MC6 relay with the HMJA relay normal the NTTS key and the KTS relay operated. The TST lead is grounded. This lead is closed through the MTFC to the trunk link frame to which the marker is

connected and operates the TST relay in the trunk link frame. This relay removes the manual make busy condition from all trunks on that trunk link frame. With the NTTS key operated, when the TST relay of the trunk link frame operates, it in turn operates the TSK relay to light the TSK lamp as an indication of satisfactory operation of the TST relay.

Wire spring markers use double wound relays, each of which operate from either an even or from the next higher numbered odd TS(0-19) switch position and, therefore, would permit the marker to select either of two trunks. To prevent this, test relay MTG in the marker opens the leads which permit the marker to prefer odd or even trunks and extends both ends of these leads to the master test control circuit as Even Trunk Selection (ETS0 and ETS1) and Odd Trunk Selection (OTS0 and OTS1). All even numbered TSU switch position connect ETS0 and ETS1 to permit selection of even trunks and all odd ones connect OTS0 to OTS1 to permit selection of odd trunks.

M6-3.7 MARKER RELEASE

When the marker has completed setting up the connection it grounds the DCT lead operating the DCT relay of the MTC which, with the REC key normal, operates the M01 relay to extend the DCT lead back to the marker to cause it to advance.

When the marker grounds the LK2 lead, the LK2 and DIS1 relay of the MTC are operated lighting the LK2 and DIS1 lamps. The marker grounds the MRL lead as a regular release signal, operating the MRL relay which lights the MRL lamp and operate the MFC relay. The MFC relay operates the MFC1 and these relays function to release the MTFC and part of the MTC. The RCY lead to the trunk test circuit is also grounded as a signal that the connection has been set.

M6-4 DESCRIPTION OF TRUNK TEST CIRCUIT OPERATION OGT(TAN) CLASS OF TRUNK TEST

On OGT TAN class of trunk test the TLK key should be operated to provide the sleeve holding ground.

When the master test control start key is operated relays OGT and TAN operate. When the start key is released the ST relay operates. A connection is set up from the originating test line to the outgoing trunk and the TT and TM relays are operated in the trunk.

Operation of the ST and TAN relays connects the telephone circuit loop to the S relay which operates and connects the CS relay to the originating test line simulating the terminating end of an incoming tandem trunk. With the TM and TT relays operated in the outgoing trunk, it is clear of bridges and is extended back through the operated OGT relay to the simulated incoming end of an incoming trunk. The terminating side of this simulated trunk is connected under control of the ANS key to the ANS coil.

The ANS key controls terminating supervision. When operated, it causes operation of the ANS relay which operates the IS relay which operates the T relay. The operated T relay reverses the tip and ring to operate CS and lights the OGT-CS lamp.

The connection is held forward from ground on the TLK key through the TAN relay to the sleeve control relays in the master test control circuit over lead LS, again through relay TAN over the S1 lead and over the S lead through the MTC circuit to the sleeve of the originating test line to hold the line hold magnets and the TM relay in the OGT arranged per tandem (SFD-M608).

M6-5 TEST FRAME RELEASE

Operating the release key at any time operates the KR and KR1 relays which lock to make contacts on a number of relays in the test circuit to insure that the circuit restores to normal before another test can be started. The KR and KR1 relays remove normal grounds to which various relays of the test circuit have operated and locked.

The MFCL relay is operated by the KR relay to release the master test frame connector by opening the start battery lead. On trunk test calls, the TKT relay is locked to ground on the N relay in addition to the operate ground from a back contact of the KR relay. If the trunk test circuit is off-normal, the TKT relay and the class-of-test relay in series with it are held operated until the trunk test circuit restores to normal and closes the battery furnished on the B lead to the N lead to operate the N relay. This allows the TKT, TKT1, TKT2, and TKT3 relays and the class-of-test relay in series with the TKT relay to release. The class-of-test relay releases. No new test call can be started until the TKT relay releases to reclose the start lead from the ST key.

While the RL may be operated at any time, it is possible that a false trouble record may be produced if it is operated at certain intervals while the marker is still connected.

SECTION M, PART 7
INCOMING TANDEM TRUNK TEST
(ITNP CLASS OF TEST)

Index

	<u>PAGE</u>
M7 INCOMING TANDEM TRUNK TEST - GENERAL	M7-2
M7-1 TEST FRAME SET UP WITH CLASS-OF-TEST CHART	M7-2
M7-2 SEQUENCE CHART - INCOMING TANDEM TRUNK TEST	M7-2
M7-3 INCOMING TANDEM TRUNK TEST - DESCRIPTION	M7-3
M7-3.1 INCOMING TANDEM TRUNK TEST - PREPARATION	M7-3
M7-3.2 START OF INCOMING TANDEM TRUNK TEST	M7-4
M7-3.3 INCOMING TANDEM TRUNK SEIZURE BY MTC	M7-4
M7-3.4 SELECTION OF MARKER BY IR	M7-5
M7-3.5 MARKER CONNECTION TO MTFC	M7-5
M7-3.6 OPERATE CONNECTING AND TEST RELAYS	M7-5
M7-3.7 INPUT OF INFORMATION TO MARKER	M7-6
M7-3.8 MARKER FUNCTIONS IN ESTABLISHING CONNECTION BETWEEN INCOMING TANDEM TRUNK AND OGT ARRANGED FOR TANDEM	M7-6
M7-3.9 MARKER RELEASE	M7-6
M7-4 DESCRIPTION OF INCOMING TANDEM TRUNK TEST CIRCUIT OPERATION	M7-7
M7-5 TEST FRAME RELEASE	M7-7

M7 INCOMING TANDEM TRUNK TEST - GENERAL

The ITNP class of trunk test is used for testing incoming tandem trunks. A patch cord connection is made from the trunk test circuit to the incoming tandem trunk under test. The marker is then directed to set up a connection to an outgoing trunk having a TT relay and requiring a sender, it operates the TT relay and gives the sender an ND signal. This gives the trunk test circuit access to the outgoing end of the trunk and allows the sender to release without pulsing.

M7-1 TEST FRAME SET UP WITH CLASS-OF-TEST CHART

The class-of-test table summarizes in tabular form the key(s) and switch(es) used to establish an ITNP class of trunk test on the chart. A single line across all columns is used to separate a particular function with its associated figure, option, key, or switch. The double line within the single lines is used to separate the various options on vintage of master test control frames. The note column and sheet notes are as follows:

- (a) Note 1 indicates that all key(s) or switch(es) must be operated to make a proper test frame set up for this particular class of test.
- (b) Note 2 indicates the key(s) or switch(es) to be used to simulate the trouble record. Refer to simulation tables in SFD-G902, G904, or G906 and their associated colored trouble record card on the opposite pages (G903, G905, or G907) or the simulated table selected. The tables and colored trouble record cards, along with the class of test tables, will assist the maintenance personnel in selecting the proper key(s) or switch(es) to be operated in order to properly simulate the reported trouble condition.
- (c) Note 3 indicates those key(s) or switch(es) used for additional marker tests, but they are not required for the trouble record test or a simulation test.

M7-2 SEQUENCE CHART - INCOMING TANDEM TRUNK TEST

The sequence chart for the INC TAN trunk test is a combination of a sequence chart and a flow chart. It is designed to show the main functional interactions between the Master Test Control (MTC) circuit, the Trunk Test (TT) circuit, the Master Test Frame Connector (MTFC) circuit and the Completing Marker (CM). Each double line box represents a particular circuit. The section and part of the SFD which provides full detail for the function is indicated within the box.

The overall progress of an INC TAN TRK TEST call is depicted by the flow from one functional box to the next. Within each box are skeletonized sequence chart depiction of the major progress points and information flow. In addition the keys and switches which are set up for the class of call are shown. The primary use of this chart is to show this overall progress of the call with key points of detail. It can be used to isolate a general trouble area if the test call fails in the setup stages.

M7-3 INCOMING TANDEM TRUNK TEST - DESCRIPTION

The Incoming Trunk No-Pulsing (ITNP) class of test is used for testing incoming tandem trunks in the No. 5 crossbar office. Before starting the test, the trunk test circuit is patched to the incoming tandem trunk to be tested via the miscellaneous circuit. The MTC circuit connects to the trunk test circuit and signals it to prepare for an ITNP class of test.

The trunk test circuit closes a loop on the tip and ring leads to the incoming trunk and grounds its D lead. The trunk connects to an incoming register as on a service call, but also extends the grounded D lead to the register which causes it to recognize that it is handling a test call. The register connects to a marker without waiting for a number to be pulsed and operates the TST relay in the marker as a test signal. The marker then sets up a connection to an outgoing trunk having a TT relay and requiring a sender, it operates the TT relay and gives the trunk test circuit access to the outgoing end of the trunk and allows the sender to release without pulsing.

M7-3.1 INCOMING TANDEM TRUNK TEST PREPARATION

In preparation for this class of test, a patch cord is connected between the (T) jack of the incoming tandem trunk circuit and the (ITT) jack of the miscellaneous circuit which is multiplied to all frames equipped with incoming trunk circuits. Before placing the patch cord, the test employee should make that particular trunk busy at the originating end so as not to interfere with service calls which might be directed to that trunk at the originating end.

At this time it becomes necessary to operate the required loop signaling keys LLP, SLP, or SXS of the trunk test circuit which closes the required loop to the A relay of the incoming trunk circuit. Also the proper sleeve key HS or LS must be operated at this time along with the TLK key and the office code of the distant terminating office to establish the proper route relay outgoing sender and outgoing trunk selection.

M7-3.2 START OF INCOMING TANDEM TRUNK TEST

Operating the ST key of the MTC circuit operates the ST relay which closes ground to operate the corresponding trunk test class relay ITNP and TAN relay.

The ITNP relay operating opens the operate path of the MC2 relay to prevent grounding certain leads to the marker which will be grounded by the incoming register, and it opens the MTP lead from the master test control to the master test connector to prevent the test circuit from selecting a marker.

Releasing the ST key removes shunting ground from the winding of the TKT relay (SFD-J104) allowing it to operate in series with the previously operated ITNP relay to ground furnished by the KR relay. The TKT relay operates the TKT1 which operates the TKT2 relay. With the ICL SW set on tandem, the TAN relay operates and provides an operate path for the KF2 relay. The operation of the KF2 and TKT1 relays provide the operate path for the TKT3 relay (J106). The operated TKT1 relay furnishes resistance battery to operate N relay of the master test control. The N relay operates the N1 relay which locks to ground on the KR relay normal and grounds the STG lead to the trunk test circuit, to operate the ST relay of the TT circuit.

M7-3.3 INCOMING TANDEM TRUNK SEIZURE BY MTC

When the MTC circuit starts the test it operates the ITNP, TAN, OGT, and ST relays in the TT circuit. The ITNP relay connects the originating supervision circuit to a simulated outgoing trunk circuit consisting of relays S and CS. The outgoing loop from this simulated trunk circuit is closed by contacts of S relay through make contacts on one of the operated keys SXS, SLP, or LLP to the tip and ring of the ITT jack. Since the latter is patched to the test jack of the incoming tandem trunk circuit, a loop is closed to the A relay in the trunk circuit under test, causing trunk to be seized when the trunk is seized by operation of its A relay over the loop closed by the S relay of the trunk test circuit. It bids for an incoming register as on a service call. When the register is connected it operates the trunk CO relay which cuts the sleeve lead of the jack through to the D lead to the IR. If the HS key is operated the HS relay operates and then operates the SLV lamp. The CS relay will operate from the trunk circuit battery and ground, but only momentarily until the register is connected to provide an on-hook condition after a brief interval of off-hook supervision. The CS relay operates the CS-OGT lamp.

Immediately after the SLV lamp lights, the LS key should be operated to provide a low resistance sleeve ground to the trunk and to the register. It is also possible to have operated the LS key initially. The ground on the sleeve operates the TCL relay in the IR informing it that it is handling a test call. The register then bids for a marker without waiting for a number to be pulsed.

In the INC TAN trunk test (ITNP class of test) the terminating supervisory circuit is connected to the OGT (TAN) trunk selected by the marker. This terminating supervisory circuit consists of the IS, A, and T relays. The ANS key controls termination supervision.

M7-3.4 SELECTION OF MARKER BY IR

The ground on the D lead causes the register to immediately bid for a marker through the incoming register marker connector. When the marker is connected, it's TST relay is operated. The TST relay puts the marker on long time out and causes the marker to connect to the master test control circuit via the master test frame connector in order to obtain the number of the line to which the test call is directed. When access has been gained, the MTFC operates the test relay in the marker putting it back on short time out and grounds the TS lead to the master test control.

M7-3.5 MARKER CONNECTION TO MTFC

On the ITNP class of test, the test circuit opens the MTP lead at the ITNP relay and does not select a marker. Instead, a marker connects to the test circuit in the following manner. The marker furnishes resistance battery through the operated TST relay over the TRST lead to the master test frame connector. This battery operates the corresponding MPR-relay and allows ground to be returned to the marker over the CI lead. The grounded CI lead, through the operated TST relay, operates the corresponding MKT-relay for that marker. The MKT-relay locks through normal contacts of the preceding MKT relays to ground on the MTL lead from the master test control. The connector grounds the TS lead to the master test control circuit.

M7-3.6 OPERATE CONNECTING AND TEST RELAYS

The grounded TS lead from the MTFC operates the TS relay which in turn operates the TS(1-10) relays. At the same time, the TS relay in the MTFC operates the MT test relay in the selected marker. The MT in turn operates other MT-relays in the marker. Some of them will depend on the keys and switches which are operated for the test.

In addition various connecting relays which generally control input information into the marker will operate or will have operated by this time depending on the keys operated. A check path through contacts of these tests and connecting relays provides a ground to operate the MC relay of the MTC when all appropriate relays are operated. The MC in turn operates the MC1-8 relays. These relays cut through many of the leads to the MTC and also control additional connecting relays.

On the ITNP class of test, the following test relays are always operated: MT, MT1, MT11, MT13, MT15, MT17, MT18, MT27, MT29, MT56.

On the ITNP class of test the following key connecting relays operate with the KY key operated. The K, K1, and the KA-KM relays depending upon amount of digits needed. If the TTL key is operated the K2 relay also operates.

M7-3.7 INPUT OF INFORMATION TO MARKER

With the test and connecting relays operated, the marker now has access to all information necessary to set the connection to an outgoing trunk of the desired route. On a normal service call all information would have come from an Incoming Register. On the test call, the incoming register FR, CN, RG position number. The INC trunk class indication and LL appearance of the INC tan trunk is still received from the IR, but the digits are obtained from the master test control.

The called number information received on an INC TAN trunk test (ITNP class of test) are the office code of the distant terminating office needed to establish the desired route and if the TTL key is operated the TH- HN- T- U- digits from the TT2 relay cross connections.

M7-3.8 MARKER FUNCTIONS IN ESTABLISHING CONNECTION BETWEEN INCOMING TANDEM TRUNK AND OGT ARRANGED FOR TANDEM

After the completing marker has received the indication of a tandem trunk test, (ITNP class of test), the office code of a distant terminating office and the incoming tandem trunk number, it functions like it would on a TOG class of call in establishing connection between the incoming tandem trunk line link appearance and the OGT arranged for tandem operation. The marker must seize the proper sender group, select an idle OGT of the desired route and translate the trunk number to a line location. if the OGT has a TT relay it operates the TT relay and gives the sender a No Digit (ND) signal, this gives the trunk test circuit access to the outgoing end of the trunk and allows the sender to release without pulsing. The channel test leads are closed through to select an idle channel between the incoming tandem trunk to be tested and the OGT arranged for tandem. The established channel is checked, the LK1 relay operates if all tests are satisfactory and the marker proceeds to disconnect and restore to normal.

M7-3.9 MARKER RELEASE

When the marker has completed setting up the connection it grounds the DCT lead operating the DCT relay of the MTC which, with the REC key normal, operates the M01 relay to extend the DCT lead back to the marker to cause it to advance.

When the marker grounds the LK2 lead, the LK2 and DIS1 relay of the MTC are operated lighting the LK2 and DIS1 lamps. The marker grounds the MRL lead as a regular release signal, operating the MRL relay which

lights the MRL lamp and operate the MFC relay. The MFC relay operates the MFC1 and these relays function to release the MTFC and part of the MTC. The RCY lead to the trunk test circuit is also grounded as a signal that the connection has been set.

M7-4 DESCRIPTION OF INCOMING TANDEM TRUNK TEST CIRCUIT OPERATION

On the ITNP (tandem) class-of-trunk test, when the master test control start key is operated, the ITNP and TAN relays operate. Relay OGT operates through this combination (SFD-M009). When the start key is released the ST relay operates closing the CS relay loop to the A relay of the trunk circuit. When the incoming register is attached, the low resistance ground on the jack sleeve informs the register that a test call is being set up. The register tells the marker which obtains the called number from the master test control circuit. The marker gives the number of the route in which the desired outgoing trunk is located, selects this trunk, operates the TT relay, and sets up the connection between the line link frame appearance of the incoming tandem trunk and the outgoing trunk. The register releases from the incoming trunk circuit.

The following connection is now established. The originating supervision circuit consisting of the TLK key and the telephone circuit is connected through the ITNP relay to a simulated outgoing trunk circuit consisting of relays S and CS. The outgoing loop of the trunk circuit is connected to the incoming tandem trunk circuit by means of the patching cord. The line link frame appearance of the incoming trunk circuit is connected to the originating end of the outgoing trunk circuit through a regular switch channel. The outgoing tip and ring of the outgoing trunk circuit are connected by the trunk circuit TT relay to the T0 and R0 leads to the trunk test circuit. In the trunk test circuit these leads are connected into the incoming side of a simulated incoming trunk circuit consisting of relays A, IS, and T. The terminating side of this simulated trunk circuit is connected under control of the ANS relay to the ANS coil. With this connection, the test employee operates the ANS key, which connects a loop consisting of battery and ground from IS relay and the ANS transformer to operate the LK relay. The operation of LK relay connects tone on the HTI lead back through the trunk circuit and enables the test employee to roughly check the trunk's transmission.

M7-5 TEST FRAME RELEASE

Operating the release key at any time operates the KR and KR1 relays which lock to make contacts on a number of relays in the test circuit to insure that the circuit restores to normal before another test can be started. The KR and KR1 relays remove normal grounds to which various relays of the test circuit have operated and locked.

The MFC1 relay is operated by the KR relay to release the master test frame connector by opening the start battery lead. On trunk test calls, the TKT relay is locked to ground on the N relay in addition to the operate ground from a back contact of the KR relay. If the trunk test circuit is off-normal, the TKT relay and the class-of-test relay in series with it are held operated until the trunk test circuit restores to normal and closes the battery furnished on the B lead to the N lead to operate the N relay. This allows the TKT, TKT1, TKT2, and TKT3 relays and the class-of-test relay in series with the TKT relay to release. The class-of-test relay releases. No new test call can be started until the TKT relay releases to reclose the start lead from the ST key.